WESTERN GAS

February 1930

20 Cents the Copy

A Dresser - Coupled joint is the mark of a good job well done—with minimum time and effort. It is your assurance of a strong, flexible, durable bond that will remain permanently tight under any and every condition of service.

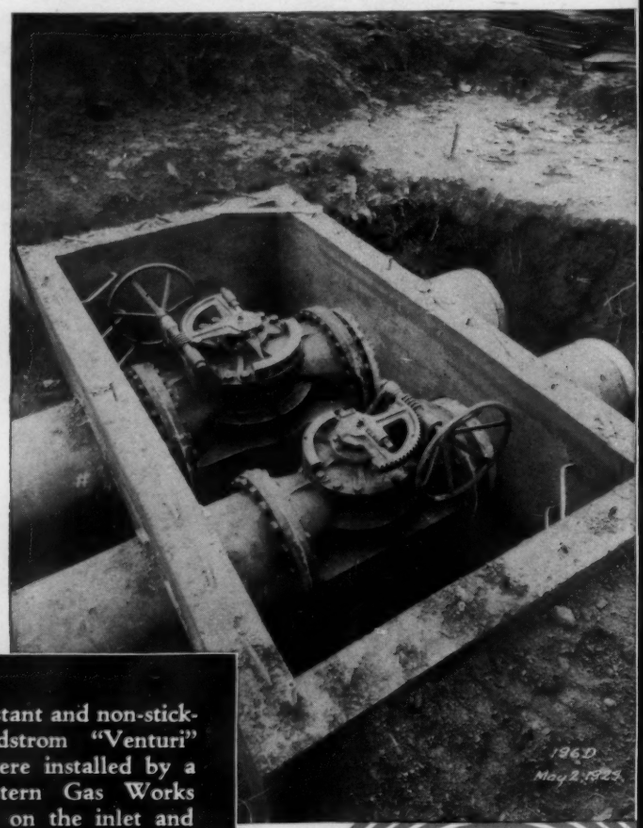
S. R. DRESSER MFG. COMPANY
Bradford Pa.

A MONTHLY JOURNAL DEVOTED TO THE WESTERN GAS & APPLIANCE INDUSTRIES

THE PERFECT APPLICATION OF A PRINCIPLE

LEAK RESISTANT

"Venturi" Valves

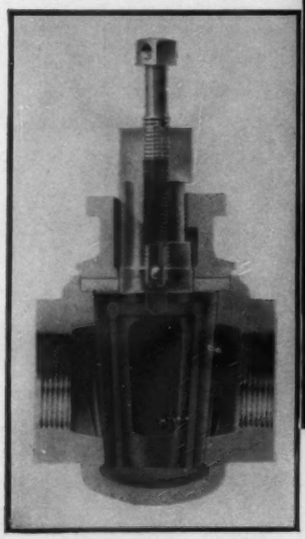


NORDSTROM VALVES

"Merco" Lubricants

Special lubricants are available for use in Nordstrom "Venturi" Valves in the Gas Industry. Our engineers will gladly recommend the lubricant best suited to your requirements.

Ask for latest Catalog.



Leak-resistant and non-sticking Nordstrom "Venturi" Valves were installed by a large eastern Gas Works Company on the inlet and outlet lines to a new gas holder. Picture above shows 24" and 30" valves in place. Lubricant under pressure seals these valves against leaks and loosens the plug should it ever be tight. Nordstrom "Venturi" Valves are moderate in cost. They are compact and easy to operate. Little lubricant is required to keep them in proper working condition. Made in sizes from 6" to 30" inclusive and for working pressures from 150 to 500 pounds.

MERCO

Merco Nordstrom Valve Company

Subsidiary of The Merrill Company

Engineers—Manufacturers

Atlanta, Healey Bldg.; Boston, 184 Boylston St.; Buffalo, Genesee Bldg.; Chicago, 176 W. Adams St.; Dallas, Magnolia Bldg.; Detroit, 2842 W. Grand Blvd.; El Paso, 111 S. Virginia St.; Houston, Petroleum Bldg.; Los Angeles, 556 S. San Pedro St.; New Orleans, Masonic Temple Bldg.; New York, 11 W. 42nd St.; Pittsburgh, Clark Bldg.; San Francisco, 343 Sansome St.

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Factories: Oakland, California, and Belleville, New Jersey. Canadian Manufacturers—Peacock Bros., Ltd., Montreal Cobalt, Winnipeg, Vancouver. England—Audley Engineering Co., Ltd., Newport, Shropshire. Buenos Aires, Argentine—General Electric. Soc. Anon., Victoria 618 Esq. Peru.

COMPRESSOR STATIONS

Engineered, Designed and Installed

FLUOR SERVICE COVERS:

FLUOR INSTALLATIONS ARE WELL BALANCED, ECONOMICAL AND PERMANENT

(1) Gasoline Absorption Plants
(2) Boiler Plants
(3) Pumping Stations
(4) Industrial Buildings
(5) Cooling Towers
(6) Tubular Coolers (any service)
(7) General Concrete Work
(8) Rigging

Avail yourself of a specialized experience and save time and money.

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SAVINGS IN GAS MAIN CONSTRUCTION

Because we provide each job with adequate modern labor-saving equipment—

Because each field organization is composed of men experienced in pipe line construction—

Because we apply the same efficient methods to gas main work that have been successful in our general construction work—

Because all our work is done on the basis of cost plus a fee, with 100% of all savings reverting to the client—

WE CAN BUILD GAS LINES AT LOW COST.

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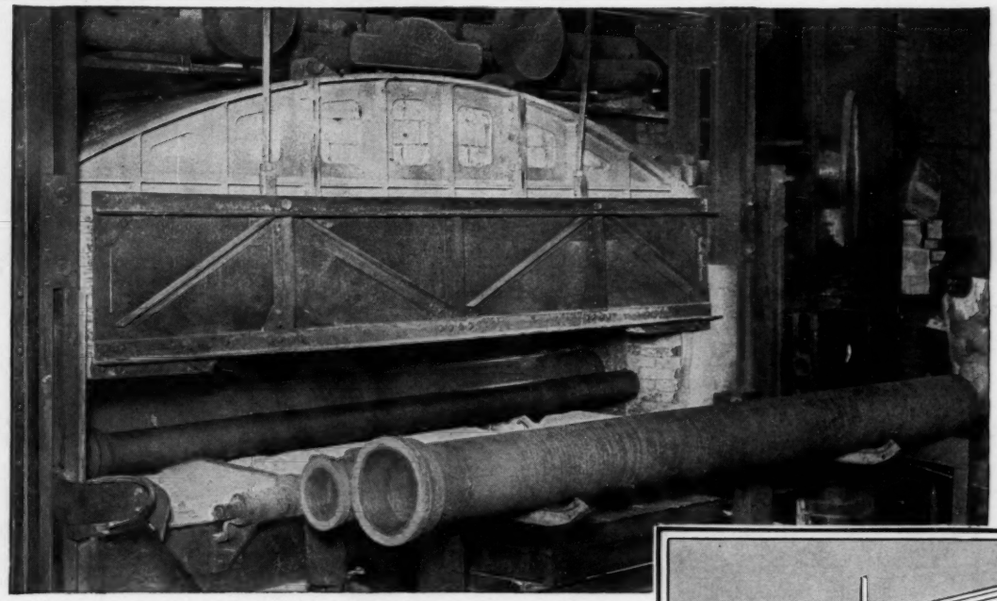
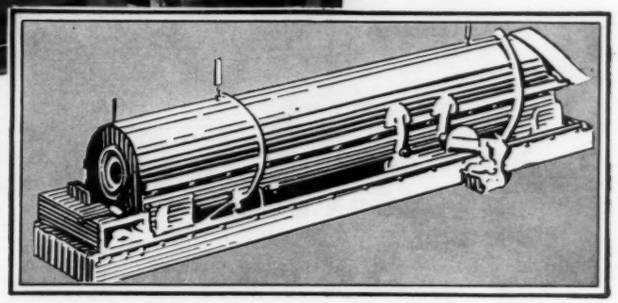


The large photograph shows the deLavaud annealing furnace where controlled temperatures uniformly anneal every length of deLavaud pipe.

Below is the famous deLavaud machine which produces the strongest cast iron pipe known.



Controlled annealing gives deLavaud pipe uniform strength and flexibility

THE controlled annealing in the manufacture of deLavaud pipe may be regarded as one of the greatest advances in the cast iron pipe industry. All cast iron pipe must be annealed at some stage of its manufacture. For annealing, as every engineer knows, reduces brittleness and tends to eliminate casting strains.

But only in the manufacture of deLavaud pipe is the annealing process accurately controlled. Every length of deLavaud pipe is heated in an oven to a temperature of 1750 degrees and *uniformly* annealed from bell to spigot. The result is the uniform flexibility of deLavaud pipe and absence of all casting strains.

The superior strength of deLavaud pipe is another reason for its wide acceptance. deLavaud pipe is made by pouring molten iron into a rapidly revolving metal mold. This mold is water jacketed. When the molten iron comes in contact with the chilled surface of the mold, a physical change takes place in the structure of the iron; all the coarse particles become finely and evenly divided. At the same time centrifugal force—a force 40 times greater than gravity—drives out impurities at the center.

The fine grain structure of deLavaud pipe metal together with its remarkable freedom from impurities enable deLavaud pipe to show an average tensile strength of more than 30,000 lbs. per square inch.

Let us send you a copy of the deLavaud handbook. It contains facts and figures regarding the most interesting pipe development in recent years.

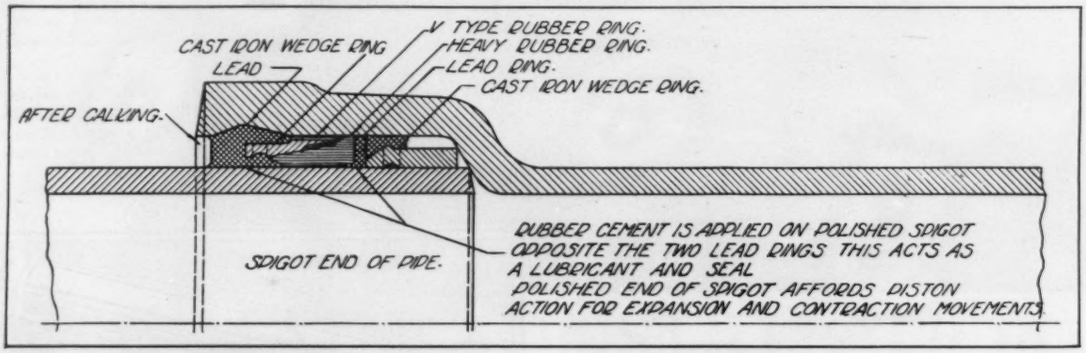
United States Pipe and Foundry Co., Burlington, N. J.

Our pipe bears the "Q-Check" trademark of The Cast Iron Pipe Research Association

Sales Offices: New York, Philadelphia, Pittsburgh, Cleveland, Buffalo, Chicago, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, San Francisco, Los Angeles

You Can't Laugh off Leaks--

but with this Pipe and Joint you can STOP THEM!


CAST IRON WEDGE RING
LEAD
V TYPE RUBBER RING.
HEAVY RUBBER RING.
LEAD RING.
CAST IRON WEDGE RING.
AFTER CALKING.
SPIGOT END OF PIPE.
RUBBED CEMENT IS APPLIED ON POLISHED SPIGOT OPPOSITE THE TWO LEAD RINGS THIS ACTS AS A LUBRICANT AND SEAL
POLISHED END OF SPIGOT AFFORDS PISTON ACTION FOR EXPANSION AND CONTRACTION MOVEMENTS.

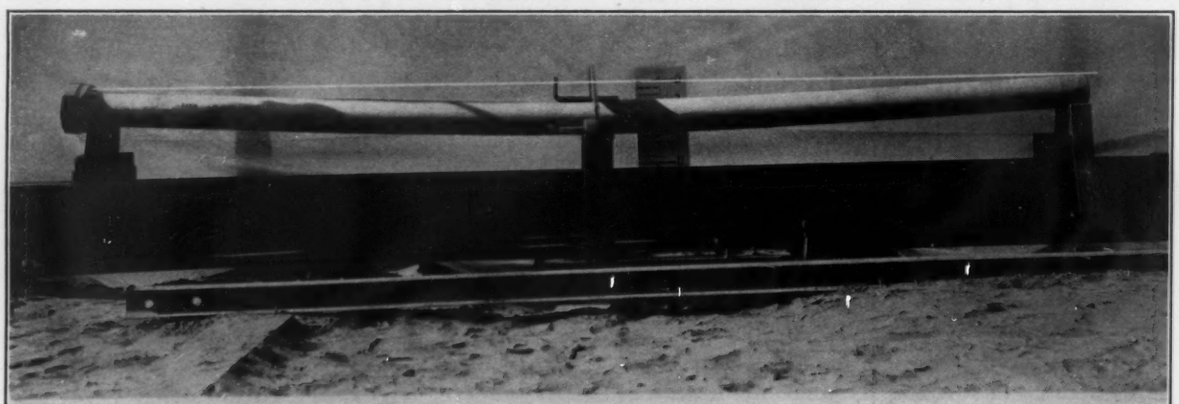
The McWane Flexpan Gas Joint

The FIRST and ONLY all-cast-iron-pipe gas-tight joint that is both FLEXIBLE and EXPANSIVE. It will flex 2 inches under 100 lbs. pressure. It will slip ¼ inch out and in, with piston-action—all without leak. And keep on doing it. Every material is PERMANENT. Meets most exacting demands of service. The man responsible for "Unaccounted-for Losses" CAN'T pass this up without investigation. It is what gas men have been seeking for years. Write for full data.

McWane Corrosion-Proof (Cast Iron) Gas Pipe

with FLEXPAN JOINTS, gives you the unequalled combination of permanent pipe with permanent leakless joints. The longevity of cast iron pipe has long been conceded. It lacked only a satisfactory method of joining the lengths. —And here you have that—Western-made, corrosion-proof cast iron pipe equipped with joints that hold the gas in your mains and services. Low cost and long life. Sizes are 1¼ through 8 inches. Investigate today.

No Need To Coat and Coddle THIS Pipe — It CAN'T Rust

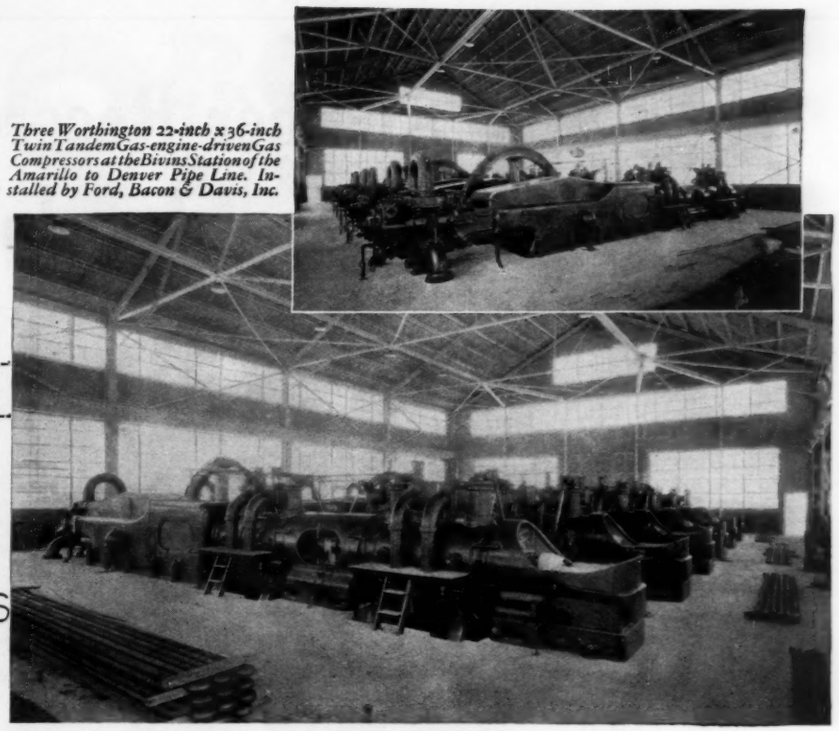


McWane-Pacific C. I. Pipe. 4-inch class 150, 12 feet long. Deflected 3¼" before breaking. Made by Pacific States Cast Iron Pipe Co., Provo, Utah.

PACIFIC STATES CAST IRON PIPE CO.

PROVO, UTAH

San Francisco—Los Angeles—Portland—Denver—Chicago—Dallas—Salt Lake City



Three Worthington 22-inch x 36-inch Twin Tandem Gas-engine-driven Gas Compressors at the Bivins Station of the Amarillo to Denver Pipe Line. Installed by Ford, Bacon & Davis, Inc.

Gas *from* Amarillo *to* Denver . . . pumped by Worthington Gas-engine-driven Compressors

NATURAL gas in Denver . . . from the Amarillo Fields . . . is a reality. A new industrial era has been opened for that city and the intermediate areas served by this great pipe line.

The gas is pumped by three Worthington Twin Tandem Gas-engine-driven Compressors in the Bivins Station at Channing, Texas. Each of these units develops 1,000 horsepower and has a capacity of 33,000,000 cubic feet per 24 hours. Additional Worthington equipment in this station consists of three Single Recompressor Engines of 170 horsepower each.

Canyon Station, near Model, Colorado, is now completed and is equipped with three similar main units of 37,000,000 cubic feet per 24 hours each.

Engineering and construction work on the line and stations was handled under the supervision of Ford, Bacon & Davis, Incorporated, New York.

Construction and operating engineers have found that, as the oldest builder of gas engines in the United States, Worthington draws upon a wealth of experience which makes reliable operation and low-cost maintenance a certainty.

Write for Bulletin S-550-B1, describing in detail Worthington Horizontal Four-cycle Double-acting Gas-engine-driven Gas Compressors

WORTHINGTON

PUMPS
COMPRESSORS
Stationary and Portable
CONDENSERS
and Auxiliaries
DIESEL ENGINES
GAS ENGINES
FEEDWATER HEATERS
WATER, OIL and
GASOLINE METERS

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EGR-4A

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WORTHINGTON

Another Record - - - of a Job Well Done

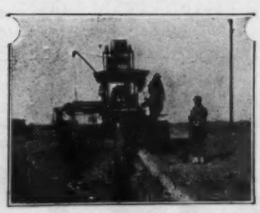
Scenes on The Monroe - Atlanta Line

ON THE new 22″ gas line of the Southern Natural Gas Corporation from the Monroe and Richland gas fields of Louisiana to Atlanta, Georgia, the Oklahoma Contracting Company was entrusted with the laying of the line from Yazoo City, Mississippi, to Tuscaloosa, Alabama, a distance of 200 miles.

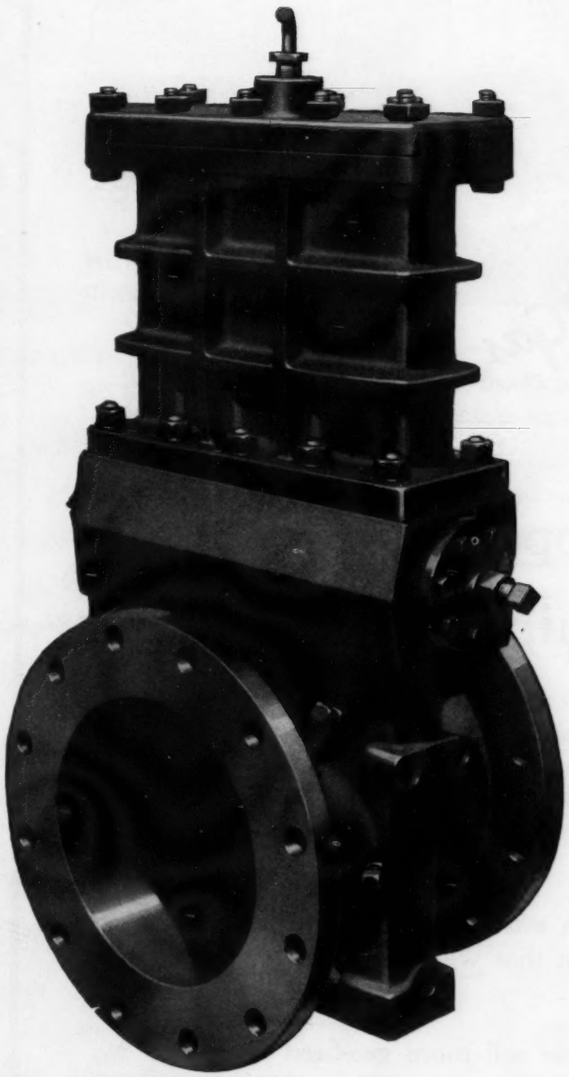
The successful completion of this line recently adds not only that much more mileage of good lines laid by the Oklahoma Contracting Company, but another record of a job well done.

To insure completion of contracts within the specified time this company maintains a full complement of modern equipment, an efficient executive organization, and adequate crews of experienced workmen.

Oklahoma Contracting Co.

DALLAS  TULSA

THESE 9 ROBINSON ADVANTAGES SAVE *Time and Money*



1. Big saving in cost of materials due to elimination of valves, tees, ells, couplings, flanges, pipe, etc., used in old style hook-up.
2. Big saving in time and labor because *one* man can haul complete Robinson "set-up" in auto to the location and can install in short time.
3. Plate changes greatly simplified and easily accomplished. No more back-breaking tasks of extracting plate from between two flanges.
4. Robinson Orifice is *always* centered, preventing errors in measurement due to plate that is not correctly installed.
5. Ease of removing and replacing plate permits frequent inspection and micrometer checking of orifice diameter. A big advantage over old-style flange set-up.
6. Robinson Orifice Fitting occupies no more space than ordinary gate valve or ordinary pressure gauge. Can be mounted in almost any position.
7. Better metering because plate is so easily changed (3 to 15 minutes) that no delay occurs in adapting meter to a changed flow condition.
8. Little or no gas loss and no hazard due to leakage when changing plates. Eliminates waste and danger of old style hook-up.
9. Gas *cannot* leak by the Robinson Fitting. Gas all goes through orifice to be correctly measured. No by-pass valve to stick open. Nothing to get out of order.

Robinson was the *first* Orifice Fitting and is the *only* Patented Orifice Fitting.

Ask for Complete Details

ROBINSON ORIFICE FITTING CO.
1435 SANTA FE AVENUE, LOS ANGELES, CALIF.
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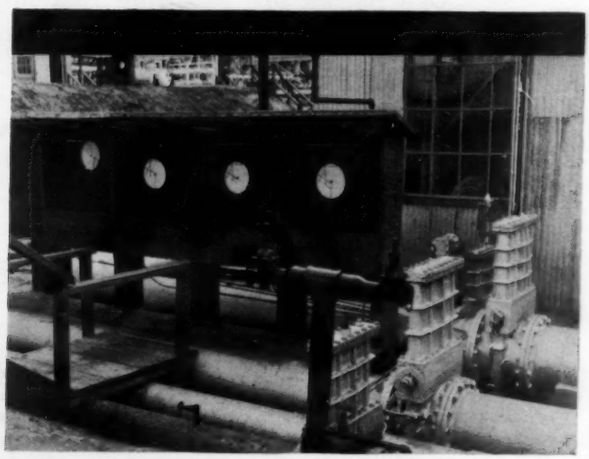
54-58 Queen Elizabeth Street, London, S. E. 1

ROBINSON ORIFICE FITTING



Note the extreme simplicity of this Robinson installation. The cumbersome and expensive by-pass is completely eliminated.

Heat
- at a finger's touch
With a furnace or boiler burning natural gas, the temperature of your home is regulated from upstairs by means of a push-button or a thermostat. No trips to the basement on cold mornings. No bother about heat when friends come. The air in your home is warm and healthful. Curtains, wall paper and furniture retain their fresh cleanliness. There is no smoke or soot about your property.
Even though you have no basement, there are fine types of gas-fired equipment for your home.
Natural gas contains twice as much heat as manufactured gas. It is a much cheaper fuel. Natural gas is the easiest fuel to control. It is absolutely safe when burned in modern appliances, correctly installed.
For full details about heating equipment that burns the cheap natural gas, see a heating contractor or phone or call at our office.
COMING SOON
Natural Gas
SERVED BY THE
PACIFIC GAS AND ELECTRIC COMPANY

Reproduction of 4 column 15" newspaper advertisement.

Here's a Great Sales Appeal for Gas-Fired Heating Equipment

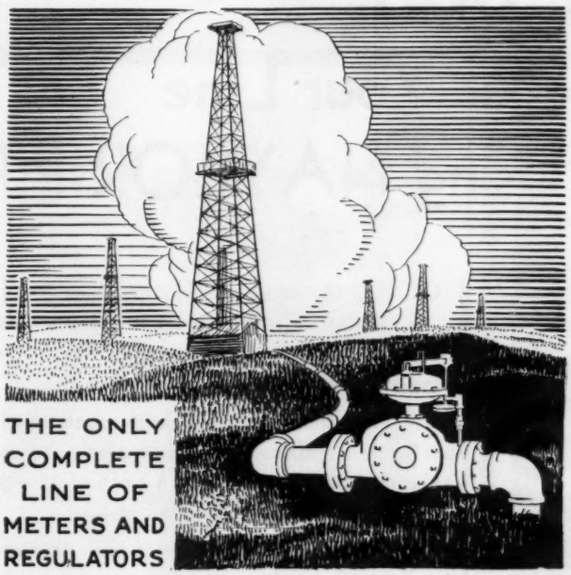
The use of gas fuel for heating banishes furnace drudgery forever.

The same thought may be expressed in many different ways, but the fundamental truth holds. Ask any heating salesman. He will confirm it.

So we are featuring that appeal in our advertising this month. And notice in the above advertisement that we also feature "cheap natural gas."

Such advertising will help **every one** sell more gas-fired heating equipment.

PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
Owned · Operated · Managed
by Californians



AT THE WELLS -EMCOS

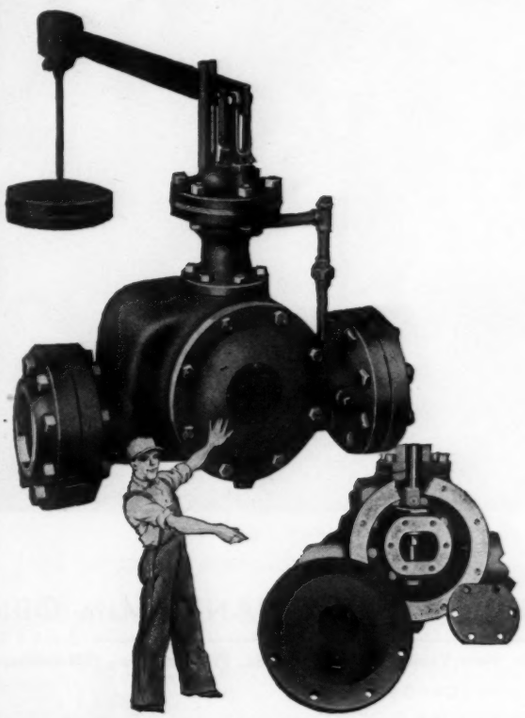
It is never necessary to remove EMCO Regulators from the line to make adjustments or repairs.

By removing the outer cover and the valve box hand hole plate, the valves, valve seats and valve stem can be readily inspected. If it is necessary to replace these parts, it is a simple matter to remove the valve box and make repairs or replacements, without in any way affecting the regulator connections. This removable valve box is an exclusive EMCO feature.

All parts of these regulators are interchangeable, making it possible to have complete assemblies on hand thus eliminating unnecessary delays and expense.

EMCO PRINCIPLES

Removable Valve Box · One Piece Body Casting
Interchangeable Diaphragm Heads
Long Sensitive Diaphragm Stroke
Relatively Short Valve Stroke



EMCO METERS AND REGULATORS

PITTSBURGH EQUITABLE METER COMPANY

Main Office and Works—Pittsburgh, Pa.

New York City · Chicago, Ill. · Los Angeles, Calif. · Tulsa, Okla. · Dallas, Texas · Columbia, S. C. · Salt Lake City · Kansas City, Mo. · Seattle, Wash. · Houston, Texas

Save $500. to $2,000.

On Every Mile of Your Line By Using NAYLOR PIPE

LOOK at the line shown in the photograph. It's a Naylor 16" pipe line, laid at the lowest cost per foot. Another Naylor installation where the saving was $500. to $2,000. per mile.

The Naylor Pipe in this line was trucked 31 miles from the rail end; carted; strung along the right of way and coupled—with just a gang of 12 men—at a total cost of only 11½ cents per foot.

Compare this low cost per foot with the cost per foot for 16" standard weight wrought pipe under similar conditions.

Naylor Pipe is the lightest of all pressure pipe. It weighs only half as much as standard weight wrought pipe. Light weight pipe reduces costs because it means half the freight to pay to get it. And when you have it, it means half the weight to truck (fewer trips yet double the load)...and half the weight to handle in the field.

Naylor Pipe is also furnished (at no extra cost) in uniform lengths of 30 and 40 feet. Here's where you reduce your coupling costs, because these lengths require fewer joints than random 18 to 22 foot lengths.

These advantages of Naylor Pipe are saving other oil and gas companies $500. to $2,000. on every mile of their lines. Choose Naylor Pipe and obtain the same economy.

NAYLOR PIPE COMPANY, Main Office & Plant, 1230 E. 92nd St., CHICAGO

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MONTREAL, CANADA
Mechanical Equipment Co.,
New Birks Building

TONCAN COPPER

Naylor Pipe

Maximum Structural Strength Mo-lyb-den-um With Minimum Weight

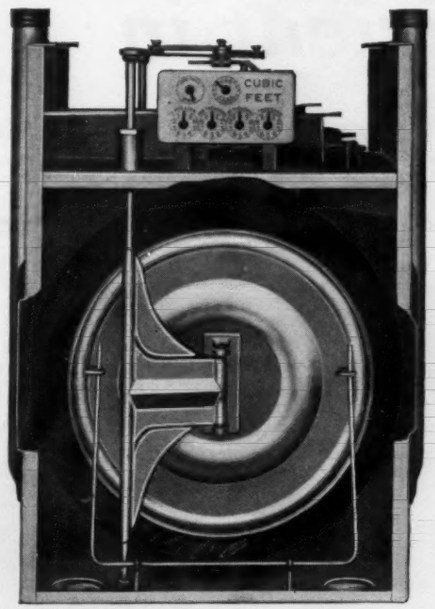
IRON

Standardized Naylor Pipe is made in sizes 6" to 12" I. D. and 14" to 20" O. D. in any uniform length desired up to 40' 0". Ends made to wrought pipe standards for all types of coupling.

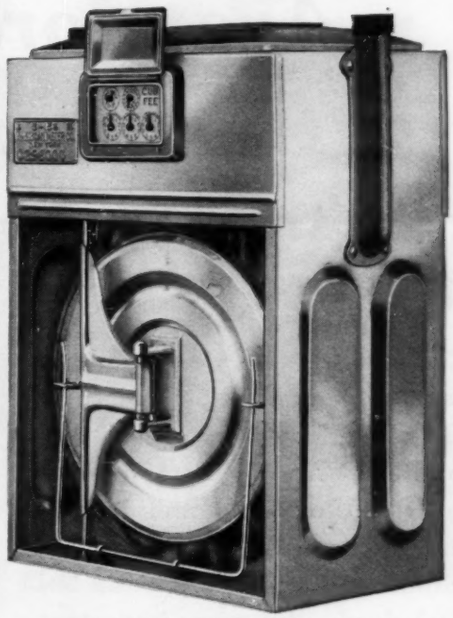
Where corrosion resistance is not a factor, Naylor Pipe can be furnished in steel.

Toncan Copper Molybdenum Iron is a development of Central Alloy Steel Corporation, the world's largest and most highly specialized alloy steel producers. It possesses a superior corrosion resistance, making it the favored pipe material.

Also C type meters (tinned steel case). Capacity range—600 to 17,500 cubic feet per hour. Six sizes.
Metric Iron Case Meters, Orifice Meters and Testing Apparatus



A type meters (tinned steel case). Rated capacity range—175 to 3400 cubic feet per hour at ½" differential. Five sizes.



B type meters (tinned steel case). Rated capacity range—150 to 7500 cubic feet per hour at ½" differential. Eight sizes.

Gas Meters that are not duplicated

AMERICAN METER COMPANY Gas Meters have every known requirement for true economy.

Collectively, these meters cover the entire range of Gas Company needs for measuring manufactured or natural gas. The line is complete. And the varying requirements of each section of the country are served by a manufacturing plant or a service station located in that area.

Individually, each meter has every quality necessary for accuracy and dependability—proper design and construction—proper metallurgical composition of parts—precise assembly—efficient operation.

Only an exact duplication of each feature in every detail can give an equivalent value.

High quality is true economy. American Meter Company Gas Meters will measure your Gas at lower cost. A nearby representative will be glad to discuss this with you.

AMERICAN METER COMPANY
JOHN J. GRIFFIN & COMPANY
HELME & McILHENNY
MARYLAND METER WORKS
D. McDONALD & COMPANY
METRIC METAL WORKS
NATHANIEL TUFTS METER WORKS
PACIFIC METER WORKS

AMERICAN METER CO. MEASUREMENT ENGINEERS CUBIC FEET

PACIFIC METER WORKS
SAN FRANCISCO LOS ANGELES
GAS METERS FOR PACIFIC COAST REQUIREMENTS

AMERICAN METER COMPANY
INCORPORATED
The World's Largest Manufacturers of Gas Meters and Allied Apparatus
ESTABLISHED 1836

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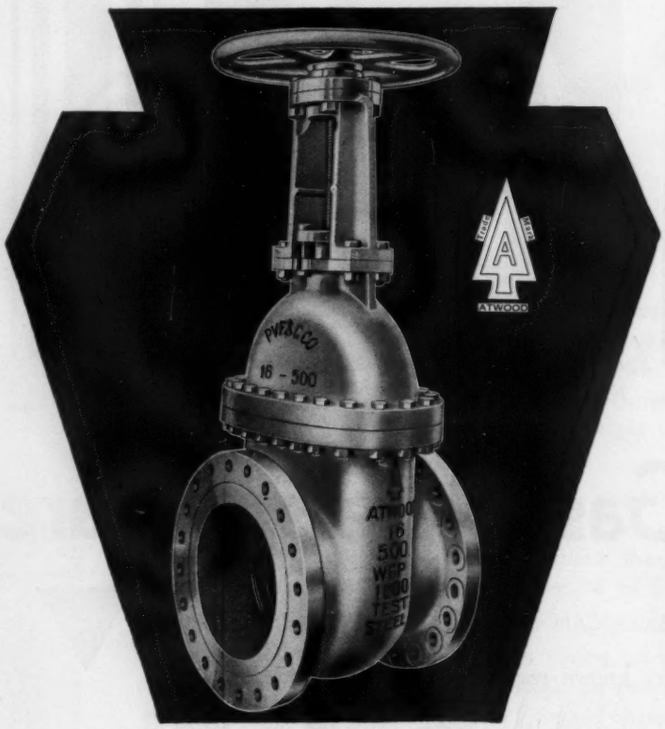
ATWOOD *Steel Valves Are More Efficient in Compressor Stations*

ONE of the leading gas companies called upon ATWOOD Service to help them overcome inefficiencies in valves on their Compressor Station lines. A valve, of ATWOOD Electric Alloy Steel and Bronze trim, as illustrated, was designed, manufactured and shipped in ten (10) days. But more important than the helpfulness and speed of ATWOOD Service, the valve fully answered the purpose for which it was designed—to the complete satisfaction of the customer.

This is but one of many cases on which this company has been called in and the problem solved. ATWOOD experience, facilities and wide range of products no doubt can meet any difficulty you are encountering and also afford you a quick and economical service for your day-to-day requirements in valves, piping and fittings.



16" ATWOOD Electric Alloy Steel, Bronze Mounted, 1000-lb. test, 500-lb. working pressure, Parallel Seat, Double Disc, O. S. & Y, Flanged Gas Gate Valve.

We shall be pleased to furnish further information.

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

PITTSBURGH ~ PENNA.

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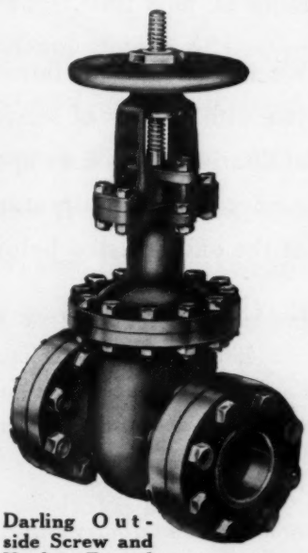
VALVES · WELDED PIPING · FITTINGS

This is all you Need to Open or Close a Darling Valve



Darling Outside Screw and Yoke Forged Steel, Flanged End Gate Valve, Dar-o-loy trimmed.

Comparisons favor Darlings. Take it from any slant you like—ease of operation, long life, accessibility, quick repair or ultimate cost.

Men of wide experience in field practice—men who have made a thorough study of valve performance under the most trying conditions—find Darlings most economical and most reliable in service.

Write for details of design and construction.

DARLING VALVE & MFG. COMPANY

Williamsport, Pa.

New York
Chicago

Oklahoma City
Houston

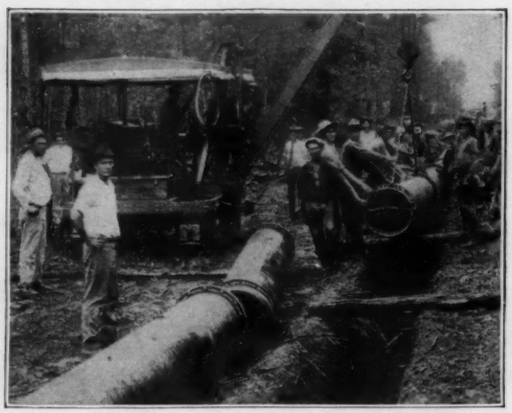
DARLING
GATE VALVES

NEW LINES CONTEMPLATED?

Investigate the new Hill, Hubbell & Company process of mechanically coating and wrapping pipe *at the mill.* Biturine Coatings are particularly adapted for use with this process.

Once the pipe is in the ground

Pipe is expensive. Pipe laying is a costly operation. But the taking up and reconditioning of old pipe lines—laid without the proper protection—is the most expensive operation of all.



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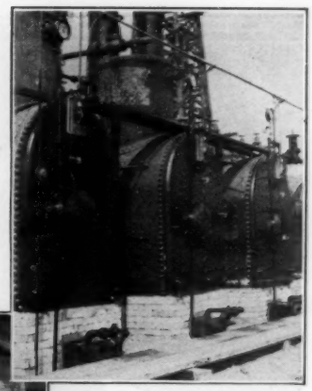

Eight N.G.E. gas burners Type A in 585 h.p. Stirling boilers of Pacific Gas & Electric Corp. Potrero plant . . . utilizing the first gas from the new 22" Kettleman Hills pipe line

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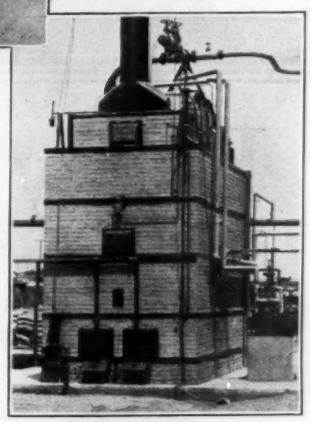

Ten years back, natural gas was so plentiful and cheap nobody cared much about efficient operation, and burners were bought at random or improvised in the plant . . .

Natural gas is still the West's most economical and satisfactory fuel, everything considered . . . but increasing demand and modern competition make waste too costly to be tolerated by any plant that hopes to survive . . .

The advantages of applying sound engineering to gas burners were first demonstrated by predecessors of today's N.G.E. burners . . . and *better performance* led to their selection for boilers of more than a half-million horsepower . . .

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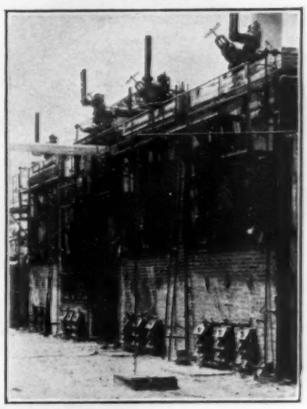
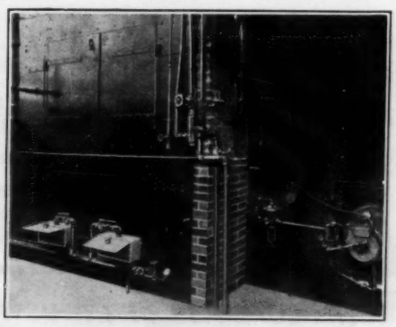
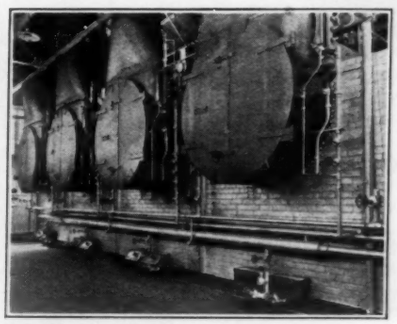


NATURAL GAS EQUIPMENT INC.

Los Angeles San Francisco Tulsa, Oklahoma



N. G. E. burners Type A in 150 h. p. boilers of San Francisco Packing Corp. made purchase of steam to meet peak loads unnecessary. Gas has since been ordered installed in second boiler.



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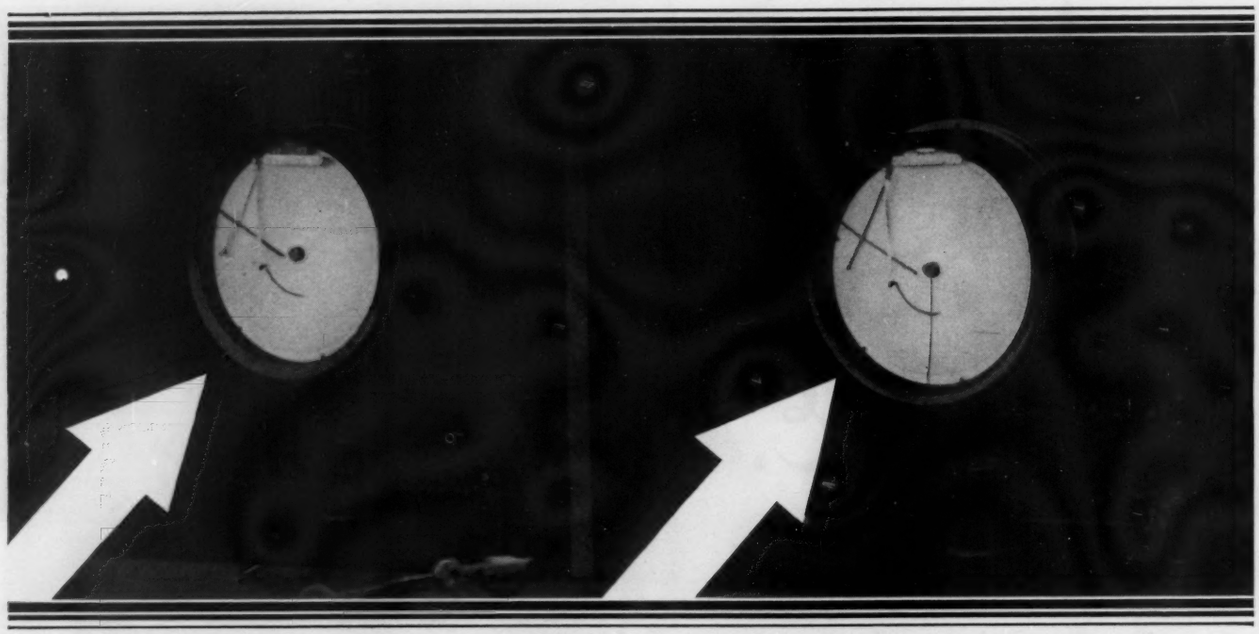
N. G. E. burners Type A in these 500 h. p. water-tube boilers . . . other conditions unchanged . . . increased output 81.5 per cent



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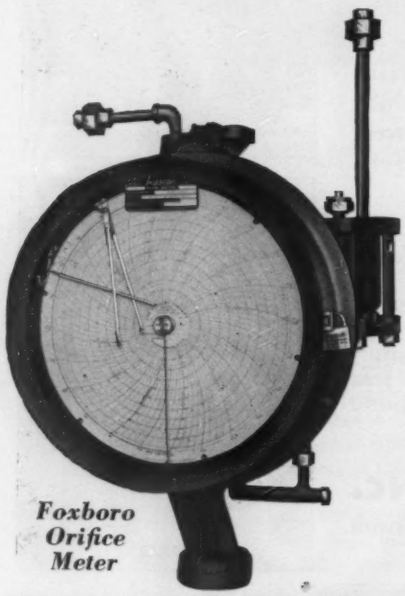

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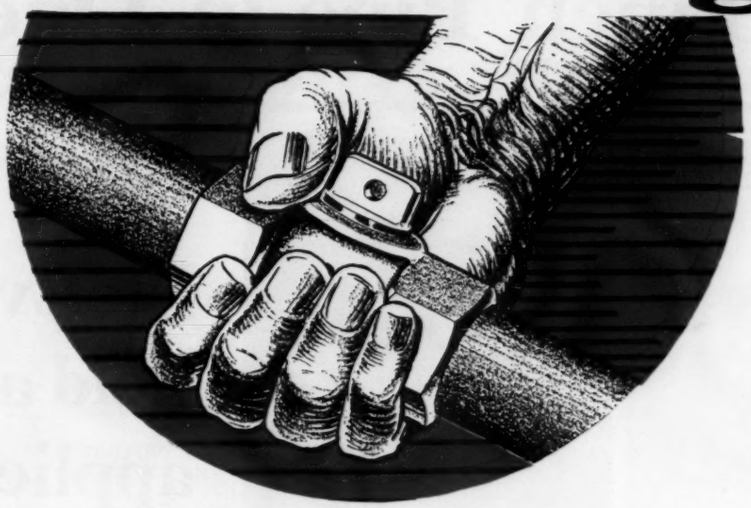

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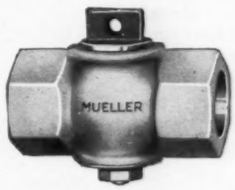

MUELLER
G-11094 Recess End Gas Stop

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3 Men Coat 1 Mile of 20-inch Pipe in One Day–

McEverlast field air-gun application does it!

McEverlast air-gun application of electrolysis-proof coating in the field pictured above. At the right is shown McEverlast Osnaburg wrap. Note how smoothly it fits over weld.

Because McEverlast coatings are cold liquids you can use them in an air-gun and cover more than a mile of 20-inch pipe line a day in the field. And it only takes three men to do the work!

On the job shown above—Kettleman Hills pipe line project of the Southern California Gas Co.—three men applied a McEverlast electrolysis-proof coating to 5600 lineal feet of 20-inch pipe line in one 9-hour day.

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—Installed Without Skilled Labor
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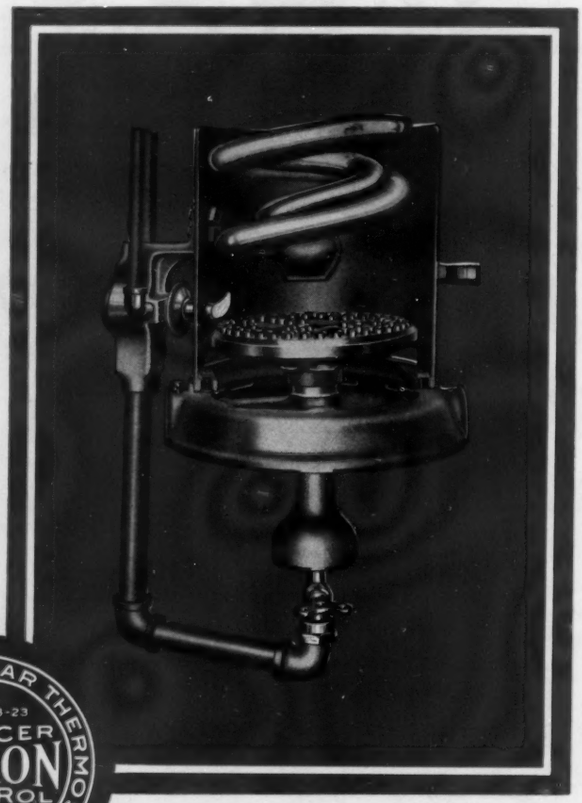

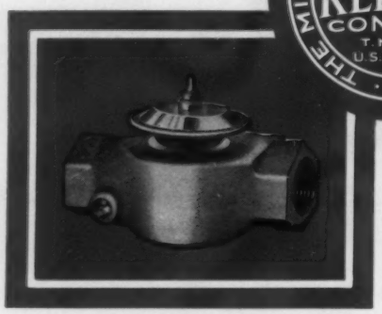

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A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

SAN FRANCISCO **LOS ANGELES** **DALLAS**

Natural Gas Odorization *in* Southern California

By F. A. HOUGH *and* GUY CORFIELD*

I. Introduction.

FOLLOWING the inauguration of straight natural gas service to domestic consumers in Los Angeles in February, 1927, several explosions occurred which might have been avoided if the gas had possessed a characteristic odor. This fact brought the need for gas odorization to the attention of gas company executives and public officials. Following a conference of gas company officials, a cooperative investigation of gas odorization was undertaken by the technical staffs of the three companies that operate in the Los Angeles basin.

F. A. Hough

This investigation has resulted in the development of materials and methods for the odorization of gas which will make it feasible to odorize all natural gas used for domestic purposes in southern California. At the present time, odorized natural gas is being supplied to the cities of Monrovia, Pasadena, Alhambra, Beverly Hills, Hollywood, Santa Monica, Culver City, Venice and Santa Barbara. The remaining cities will be supplied with odorized gas as soon as the necessary equipment can be installed. The average daily send-out of odorized gas will then be in the neighborhood of 250,000,000 cubic feet.

This paper summarizes the information obtained thus far in the investigation. It must be considered as a progress report, since much will be learned as a result of large scale operations over a long period of time.

II. Review of Previous Work.

An examination of the technical literature dealing with odorants for gas discloses that earlier than 1918 certain German cities required odorization as a protection against carbon monoxide poisoning from blue water gas, and that in 1919 the U. S. Bureau of Mines had investigated stenches as a warning to be used in mines. Odorization of natural gas, as a preventative for explosions, was first dealt with in the U. S. Bureau of Mines Technical Paper 267—"Stenches for Detecting Leakage of Blue Water Gas and Natural Gas," 1920.

In that paper the chemical, physical and physiological properties of 24 stenches are given, together with their intensity of odor, and a description of a method for measuring same. Prices at the time of writing, and data on the application of these stenches to gas lines are also given.

The stenches described are for the most part pure chemicals with odors of varying intensity, both pleasant and disagreeable. The list apparently covered the field of pure chemical possibilities, and upon careful examination, all, with the exception of ethyl mercaptan, were found to be, for one or more reasons, unsuitable as practical odorants.

Since the publication of Technical Paper 267 considerable field work has been done by the Bureau of Mines and by various gas companies, and a few private individuals, covering not only many more chemical compounds, but also eye irritants, nasal irritants, and so-called "sneeze gases." Little has been published about these investigations. It appears that no gas company has heretofore attempted odorization as a practical, continuous and large-scale operation.

Guy Corfield

An interesting experiment in gas odorization is described in the Gas Age-Record for October 12, 1929, by E. A. Munyan of the Union Gas & Electric Company, and entitled "Ethyl Mercaptan for Locating Gas Leaks." That company injected ethyl mercaptan into the mains of the city of Middletown, Ohio, which city has 7,500 meters and a daily send-out of 8000 M. cu. ft. The

*Mr. Hough is research engineer for the Southern Counties Gas Company; Mr. Corfield, chief chemist for the Los Angeles Gas and Electric Corporation. *Western Gas* welcomes its opportunity to present this valuable article, in which the co-authors set down results secured in their collaborative investigation of odorants and development of methods and apparatus for their use. —*Editor.*

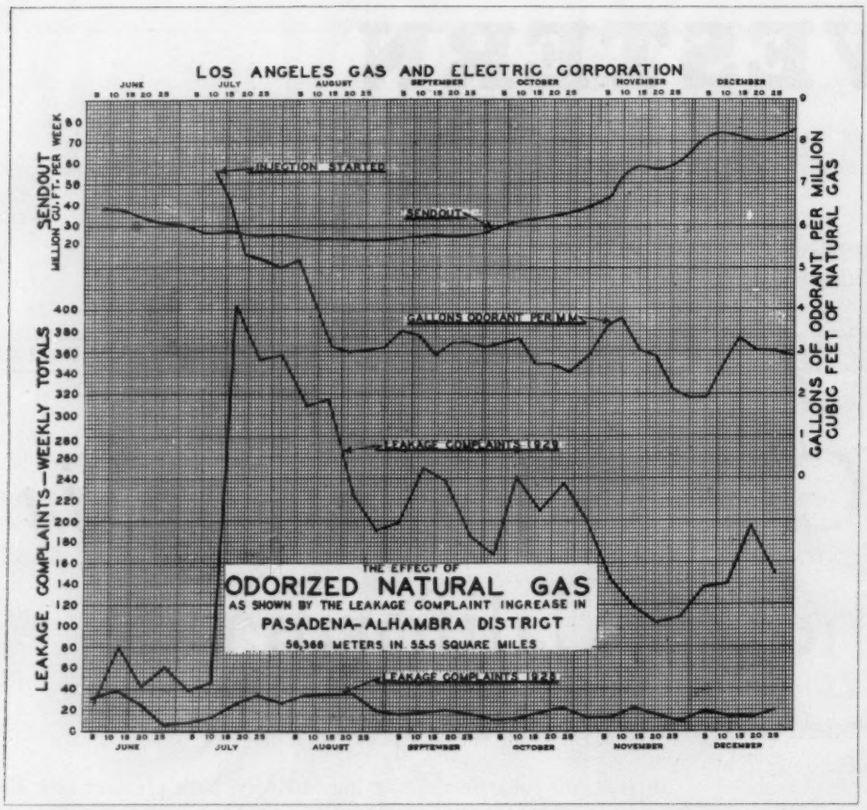

LOS ANGELES GAS AND ELECTRIC CORPORATION
SENDOUT MILLION CU. FT. PER WEEK
LEAKAGE COMPLAINTS—WEEKLY TOTALS
GALLONS OF ODORANT PER MILLION CUBIC FEET OF NATURAL GAS
INJECTION STARTED
SENDOUT
GALLONS ODORANT PER M.M.C.F.
LEAKAGE COMPLAINTS 1928
LEAKAGE COMPLAINTS 1929
THE EFFECT OF
ODORIZED NATURAL GAS
AS SHOWN BY THE LEAKAGE COMPLAINT INCREASE IN
PASADENA-ALHAMBRA DISTRICT
56,366 METERS IN 55.5 SQUARE MILES
JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

Fig. 1. Effect of natural gas odorization upon number of leakage complaints received.

test lasted 10 days, during which period 128.5 lbs. of ethyl mercaptan were injected. During this period 720 leaks of all descriptions were discovered, at a considerable saving over the cost of the usual methods of leakage detection.

III. The Odorizing Material.

A satisfactory odorant must be non-toxic, non-corrosive, insoluble in water, unpleasant but not nauseating, penetrating, cheap, easily handled and readily available in continuous supply. Also the odorant must completely burn to harmless and odorless combustion products. It should have an odor which the public will readily associate with gas, and it should not change nor lose its identity or strength by chemical combination with the gas, the mains, the meters or other distribution materials.

To reduce the explosion hazard to a minimum, it has been considered essential in this investigation that gas should be sufficiently odorized so that when the atmosphere of a room contains 1 per cent gas a distinct gas odor will readily be detected by a normal person in the room. This gives a factor of safety of a little more than 4 (the lower explosive limit of natural gas is about 4.4 per cent) to take care of variations in the sensitivity of the olfactory nerves of different people in different conditions of health.

Ethyl mercaptan was first investigated, but was discarded because of its high cost and nauseating odor.

Having in mind the general odor of an oil refinery and the specific pungent qualities of a cracked petroleum oil, the research department of the Standard Oil Company of California was requested to investigate the possibility of supplying a light oil in which these odors would be concentrated. This they agreed to do, with the result that after some five or six samples were submitted and tested on a laboratory scale, an oil was produced that seemed to have the necessary requirements. Enough was procured to make practical injection tests in a number of small districts and communities. The results of these tests were very gratifying. The odor was satisfactory and sufficiently strong to require only about 3.5 gallons of odorant per million standard cubic feet of gas. With this concentration of odorant, 1 per cent of gas in the atmosphere of a room was easily noticeable.

There developed, however, one grave objection, for it was found that above gas line pressures of about 10 pounds per square inch, the oil would not completely vaporize into the gas. Considerable condensate, or drippage, was recovered. This condensation would, of course, increase as pressures were increased, so the Standard Oil Company was asked to modify the oil so that at 250 pounds gauge pressure and 55° F. complete vaporization of 3.5 gallons per million cu. ft. of gas could be effected. After considerable research, the oil company was able to meet these conditions, and an oil was produced which appears to be satisfactory in every respect. This product, termed Cal-Odorant Oil No. 3, has the following average physical and chemical properties:

Gravity 40.0 deg. A.P.I. @ 60° F. equals
0.8251 Specific Gravity equals
6.870 lbs. per gallon

Flash below 75° F.

Fire 75° F.

Total Sulphur 4.5% (bomb test)

Acidity—None (By Method 510.2, U. S. Govt. Master Spec.)

Distillation (By Method 100.13, U. S. Govt. Master Spec.)

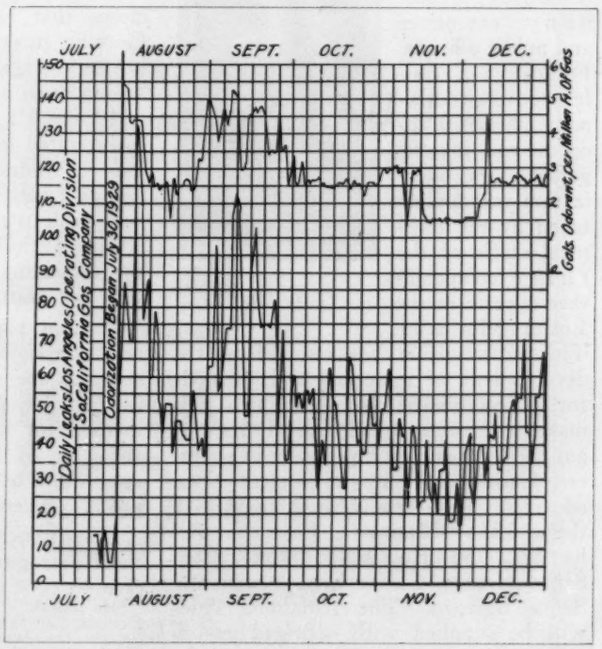

JULY AUGUST SEPT. OCT. NOV. DEC.
Daily Leaks Los Angeles Operating Division
So. California Gas Company
Odorization Began July 30, 1929
Gals. Odorant per Million A. Of Gas

Fig. 2. Leakage complaints as related to odorization in the Southern California Gas Company's Los Angeles Operating Division.

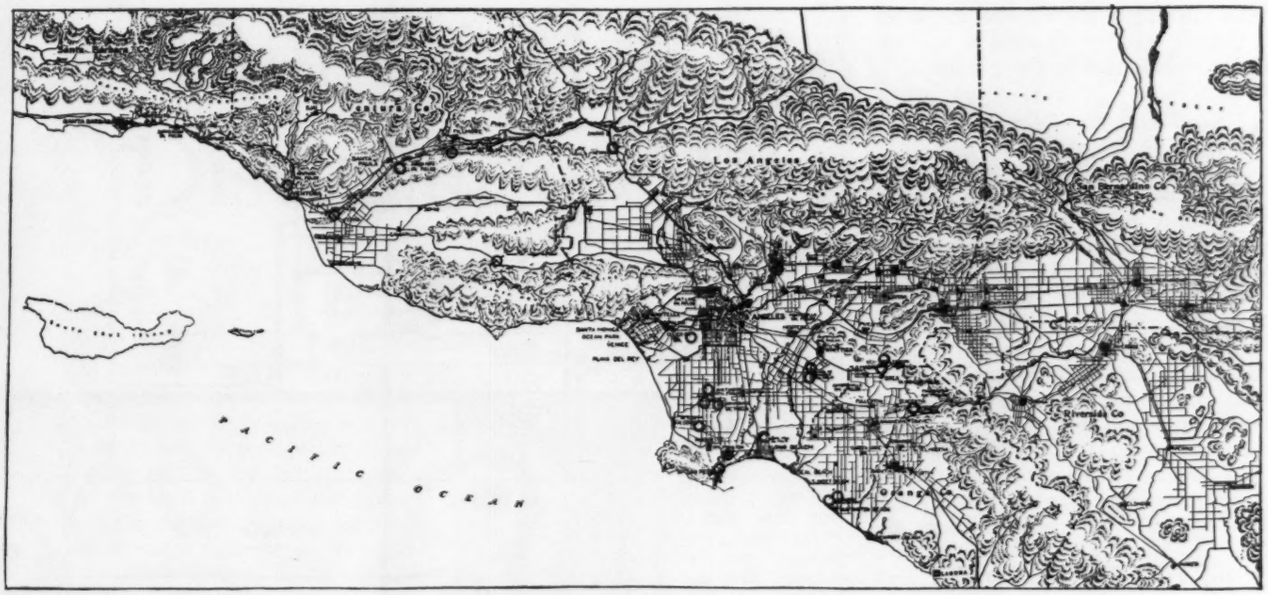


Fig. 3. Map showing major portion of territory to be supplied with odorized natural gas by three companies operating in southern California. Portions of six counties are included in the program, which will affect several score of communities. The circles indicate locations of odorization stations.

First Drop @ 130° F.	Initial	
10% @ 209		
20% @ 256		
30% @ 279		
40% @ 296		
50% @ 306		
60% @ 328		
70% @ 342		
80% @ 361		
90% @ 384		
99% @ 439	Maximum	
Molecular weight	125	
Vapor Pressure	1	mm. mercury at 55°F.
(100% vaporized)	1.5	at 65
	2.0	at 75
	2.8	at 85
	4.0	at 95

The significant feature of this oil is the sulphur content, as it is by virtue of the sulphur compounds that it possesses its characteristic odor. The total sulphur is divided approximately as follows:

Combined as alkyl mercaptans	5%	85% Odorant sulphur
Combined as alkyl Disulphides	25%	
Combined as alkyl sulphides	55%	
Combined as thiophenes	13%	15% non-odorant sulphur
Elementary		
Hydrogen sulphide—None		

It will be noted that this sulphur is practically all of a complex organic nature. It is distributed evenly throughout the boiling range of the oil, so that each 10 per cent portion of distillate contains approximately the same amount. As regards introduction of sulphur into the gas, a calculation shows that with 3 gallons of oil per million cubic feet, the total amount of organic sulphur introduced will be less than 1 grain per 100 cubic feet of gas. This is entirely negligible, as the allowable limit as set by most state regulatory bodies is 30 grains per 100 cubic feet. The absence of hydrogen sulphide also complies with good practice and government regulations.

The following purchase specifications have been adopted:

1. The gas odorant shall be a petroleum product free from water and all suspended matter and similar in character to sample No. 17118-R (described above).
2. Distillation Range (Method 100.13 U. S. Govt. Master Spec. B. of M. Tech. Paper 323 C).
   (a) When 50% has been recovered in the receiver, the thermometer shall not read more than 325°F.
   (b) When 90% has been recovered in the receiver, the thermometer shall not read more than 385°F.
   (c) The end point shall not be higher than 440°F.
   (d) At least 95% shall be recovered in the receiver from the distillation.
3. Sulphur
   (a) Total sulphur content (by bomb test) shall not be less than 4.0% by weight, and the average of all shipments shall not be less than 4.5%.
   (b) Hydrogen sulphide. Not more than a trace.
4. Acidity. No pink or red color shall be formed when the acidity test (Method 510.2 U. S. Govt. Master Spec. B. of M. Tech. Paper 323C) is applied to residue remaining in distilling flask after distillation test.

It might be pointed out here that this odorant oil is a complex mixture of compound of various boiling points. It has no definite chemical constants and is therefore evaluated in terms of refinery processes and boiling range. By specifying the maximum boiling points of certain fractions, as enumerated above, the desired volatility is assured. The vapor pressures already given are derived from dew point determinations.

The absence of acidity and hydrogen sulphide probably eliminates the possibility of corrosion of distribution materials, and as the oil will be present in the vapor phase, no difficulty is expected with diaphragms and gaskets. This material has been in continuous use in some districts for seven months prior to the time of writing, and no damage to distribution properties has been observed.

Although the quantity of this new odorant to be used per million feet of natural gas has not yet been definitely decided upon, it seems now that from two to three gallons per million will give the desired results.

With a ground temperature of 55° F., the gallons of odorant required to saturate 1,000,000 cu. ft. of gas at various gage pressures are as follows:

Gage Pressure lbs. per sq. in.	*Gallons Odorant Required to Saturate 1,000,000 cu. ft. of Gas. (Temp. 55° F.)*
400	2.24
300	2.94
200	4.32
100	8.10
50	12.42

Any attempt to use more of the odorant than is required to saturate will result in condensation in the gas lines.

IV. Results Obtained During Large Scale Tests

The introduction of odorized gas into a community has always resulted in a very large increase in the number of leak complaints received. In Fig. 1 a chart is given, showing the number of leak complaints arising in the Pasadena-Alhambra district of the Los Angeles Gas and Electric Corporation, immediately preceding the introduction of odorized gas and for the five months period following its introduction. A curve showing leaks for the same period of the preceding year is also shown. These results are typical of those obtained in all localities supplied with odorized gas. The peak day for leak complaints usually occurs about the third day after odorization starts. The number received during the peak is usually about 10 times the average for unodorized gas. After the peak has been reached, the number of complaints received drops off gradually and finally reaches a fairly constant level, which is about five times as high as the former average.

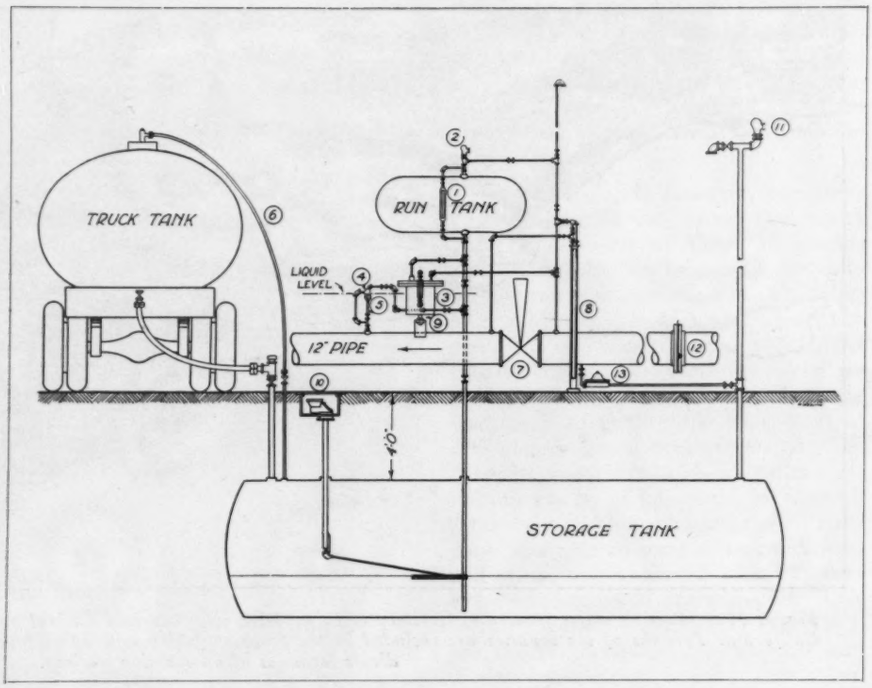


Fig. 5. Diagram of an odorization station.

LEGEND TO FIG. 5

1. Liquid level gage.
2. Relief valve.
3. Float valve.
4. Sight feed.
5. Calibrated chamber for checking rate of liquid flow.
6. Breather line to prevent the blowing of odorant fumes into atmosphere and to prevent the formation of an explosive mixture inside the truck tank.
7. Gate valve partially closed.
8. High pressure U-gage to indicate pressure drop across gate valve.
9. Adjustable support for float valve chamber.
10. Float-actuated liquid level indicator.
11. Relief valve.
12. Orifice meter.
13. Pressure regulator.

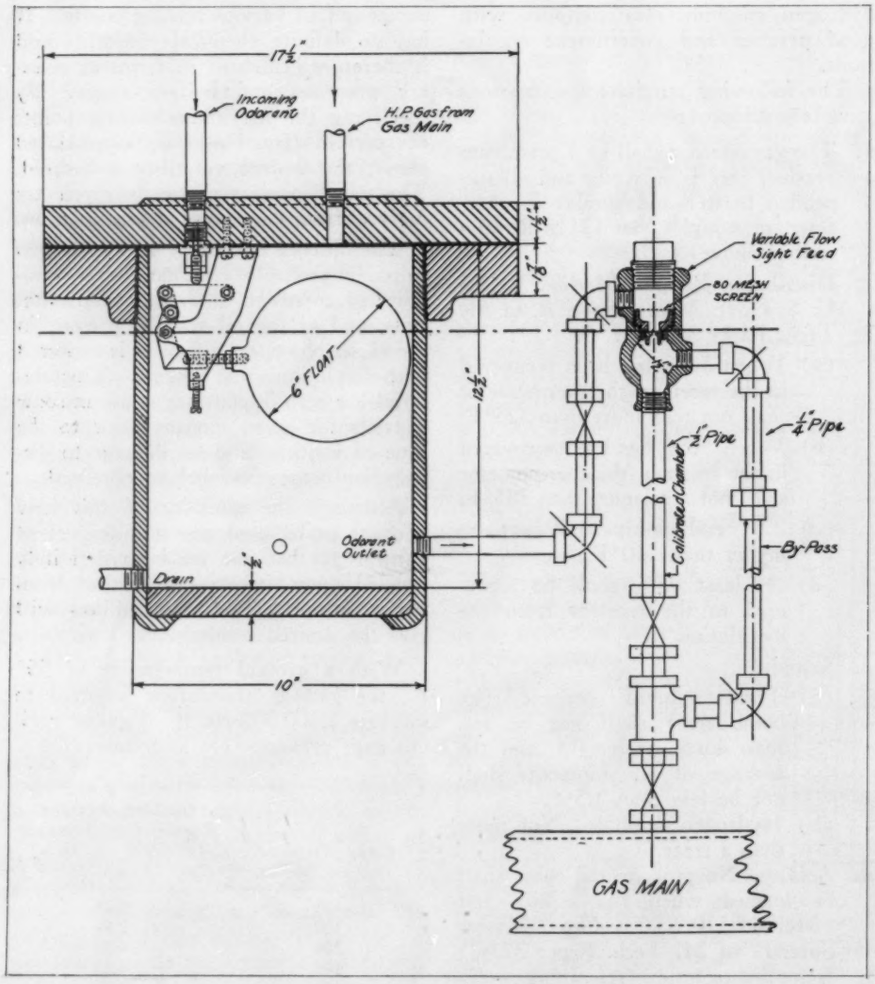


Fig. 4. Liquid flow control for gas odorizer

It is not possible as yet to tell just what the permanent effect of gas odorization on number of leak complaints is going to be, but it seems evident that there will always be a higher number with odorized gas than with unodorized gas.

The odorant used in Pasadena and Alhambra during the period to which Fig. 1 applies was an odorant of lower volatility than the material we are now using. The number of gallons indicated is the number actually vaporized and not the number injected. It is probable that even smaller quantities of the new material can be used than those indicated on the chart. The odor of the two materials is practically the same.

(Continued on Page 53)

DISCREPANCY IN PRINTING

A Unit *of* Man-Power *for the* Distribution Department

By F. S. HONBERGER

Assistant Superintendent of Distribution
Southern California Gas Company

IN this age of industrialism, the personal element which so often influences a worker's rating in the organization through which he gains his livelihood, is being largely replaced by actual performance records, or, as is so often heard in baseball parlance, batting averages. It must not be misunderstood that the personal element in the individual is entirely ignored in the judging of a man's qualifications for a promotion to a higher position, but that those personal qualifications are no longer the only factors which are today taken into consideration in determining his advancement in the personnel of the organization of which he is a member.

In all fairness to his fellow employees, it is only just that in addition to his standing with regard to seniority with his company, an employee's actual ability should be considered when an increase in remuneration is in order.

It can readily be seen that in addition to the employee's attitude as an individual toward performance records, his organization has identical interests not only so far as the employee is concerned, but also in the positive observance of the current volume of work performed.

The problem at hand is the choice of a unit of time and work which can easily and readily be conceived without stretching the imgination; one which is naturally and instinctively comprehended.

It is felt that the unit which naturally appeals to our sense of time and power is the "man day," for when we think of performance as far as human effort is concerned, we think of the amount of work which a man can perform in one working day; that day at present is usually understood as being eight hours in duration.

Depending upon the reader's desire or need, this length of a man day can be so chosen as to suit his working period. Once having chosen his unit of time, any hours in excess of the multiple of the unit can be expressed in fractions of the unit.

Its application in such enterprises which concern the individual performance of many employees is legion, but in this specific instance, its application to the gas utility is paramount.

F. S. Honberger

DISTRIBUTION department executives in several western gas companies are giving thought to the use of the "man-day" yardstick for construction and service operations. Its value for performance comparisons within a company is evident, though considerable standardization would necessarily precede its intelligent use for inter-company comparisons in many fields.

Mr. Honberger's discussion in these pages forms an introduction to an interesting topic—one on which *Western Gas* contributors will present further experience in the near future.—*Editor.*

The application of this unit was first made in connection with the laying of new services and later its use has spread to other kinds and types of work which are included in public utility construction and service to the customer.

Its specific use in "service lays" is noteworthy, as it furnishes not only a comparison in the ability of the foreman and men in the same district but also an explanation of imaginary shortcomings or actual difficulties in various districts.

A typical form as used for service lays will illustrate its application and value. (See Form No. 1.)

It will be noted that the influencing factors "Pavement Cut" and "Miles Travelled per Service" are of interest, as they influence materially the number of feet of service laid per man per day.

This monthly statement is obtained from the daily record of the service foreman, which gives the details of each service laid. The details considered are given in Form No. 2.

Its application is similar in new main work, in which case not only is the trench opened up by manual labor observed, but the combination of machine trenching and manual digging is observed. It will be noted that its application in the two foregoing instances has pertained to construction work charged to capital account.

With respect to construction work, its value in estimating costs is obvious. Performance figures can be established through the man-day unit which, when used with an average wage whose basis is the determined period for the man day, give close approximation in checking first cost or final figures. Then, too, it is also of value in checking progress reports on the larger construction jobs.

In the matter of service to the consumer by those employees who have a specific kind of work to perform, such as turn-on or turn-off meters, setting of meters or handling complaint orders, the number of orders performed over a period of time reduced to the man-day unit together with the average mileage per order is of value in determining standards of performance. It is of further value to the dispatching office in that it tends to an increase in the economy of mileage per order by better efficiency in routing—the natural corollary being an increase in the number of orders performed per man day.

(Continued on Page 62)

FORM NO. 1. MONTHLY STATEMENT SUMMARIZING DATA ON SERVICE LAYS

Name of Foreman	Number Services	Length	Area Pavement Cut	Auto Miles	Hours	Feet per Man Day
Total						
Average Length of Service						
Average Area of Pavement Cut						
Average Miles Travelled per Service						
Average Feet of Service Laid per Man Day						

FORM NO. 2. DAILY RECORD OF SERVICE FOREMAN

Name of Foreman ..... Date .....

Service Number	Size of Pipe	Length of Service	Area Pavement cut	Kind of Pavement	Miles	Hours	Feet per Man Day
Total							

LOUISIANA

River crossing operations in progress on the Mississippi

MISSISSIPPI

A bit of right-of-way in Mississippi, near Yazoo City

Natural Gas *for the* South

By P. McDONALD BIDDISON

THE completion of the initial program of construction by Southern Natural Gas Corporation brings natural gas from the Louisiana fields into Mississippi, Alabama, and Georgia. The line is notable from the standpoint of length, size, and pressures carried. Some of the interesting features are pointed out herein.

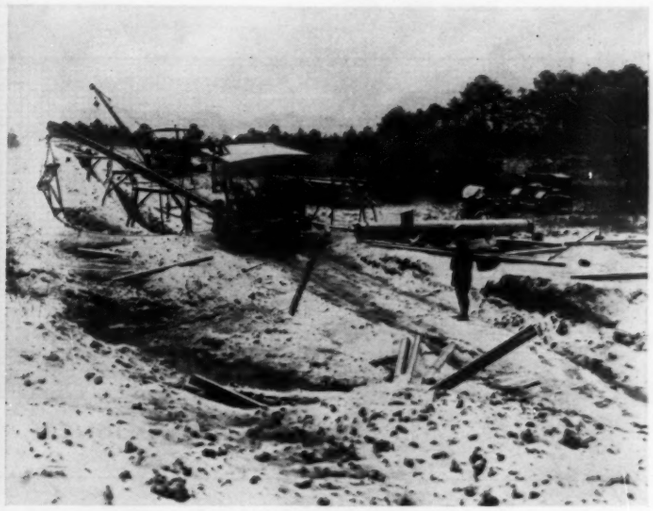
The project was conceived by Adam Davidson of Dallas, Texas, who interested R. C. Sharp of Tulsa (formerly President of Oklahoma Natural Gas Company, now president of Independent Oil Company). Arthur L. Mullergren, Kansas City, was engaged to make a survey of the markets and of the cost of construction and of earnings. A contract for gas supply was entered into with a group of gas producers who controlled the greater part of the production in the Monroe and Richland gas fields of Louisiana, including Interstate Natural Gas, Hope Producing Company (subsidiaries of Standard of New Jersey) Southern Carbon, United Carbon, Industrial Gas (subsidiary of Electric Power Light) and W. C. Feazel.

In March a contract was closed with Southern Cities Public Service Company for the furnishing of natural gas to certain cities in which they had recently purchased the distribution systems. Under this contract the cities to be reached by the initial transmission system were, Columbus, Mississippi, Tuscaloosa, Anniston, Gadsden, Atlalla and Alabama City, all in Alabama; Rome, Atlanta, College Park, East Point and Bolton, in Georgia. Other cities to be supplied by extension from the initial installation are Meridian, Mississippi; Selma and Montgomery, in Alabama; Macon and Griffin, Georgia.

Previously to closing of the contract with Southern Cities Public Service Company, the Southern Natural Gas organization had closed contracts with numerous industrial plants in Mississippi, Alabama, and Georgia, this work being under the supervision of J. B. Milmoe. These industrial contracts and the contracts with Southern Cities

Main line and laterals included in initial construction of the

ALABAMA
Part of gang No. 3 working east near Toadvine, Alabama



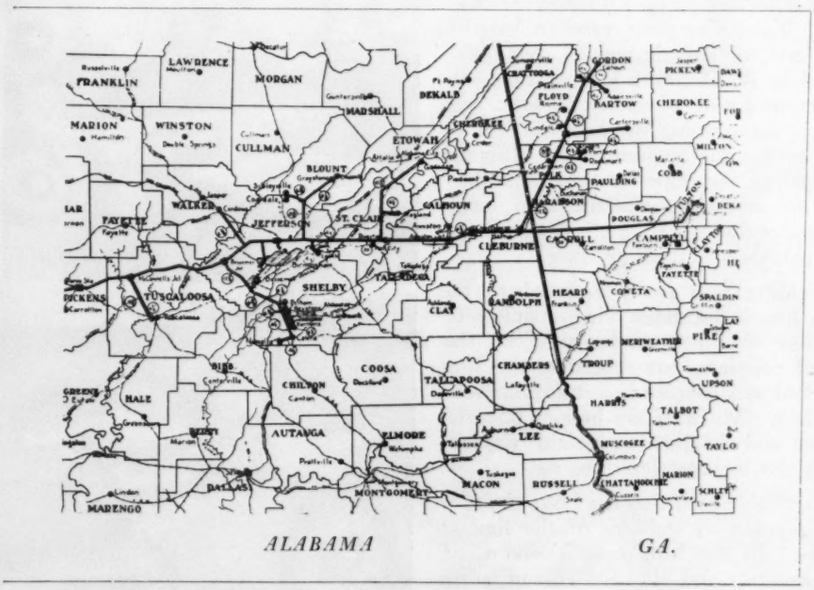
GEORGIA
Backfilling near Atlanta meter station after a snowfall

through a 909-Mile Carrier

Consulting Engineer
Monroe, Louisiana

Public Service Company provided a sufficiently firm business to justify the line, and financing followed immediately by a group composed of G. L. Ohrstrom & Company, Halsey Stuart & Company, Graham, Parsons & Company, Coffin & Burr, and A. G. Becker & Company.

Financing was done on the basis of final estimates of cost and earnings by Ford Bacon & Davis, which firm was engaged as engineers, constructors, and managers for the construction period and for some time thereafter under operating conditions. The Southern Natural Gas Corporation organization is headed by J. H. White, president. Ford Bacon & Davis operations were under the direction of A. L. Black, local manager, William Von Phul, resident engineer with Ford Bacon & Davis staff, and personnel assisting. Upon beginning of operations, Edgar G. Hill, representing Ford Bacon & Davis, was made vice-president and general manager of Southern Natural Gas Corporation. P. McDonald Biddison was retained throughout the construction period as consulting engineer by Southern Natural Gas Corporation.



Southern Natural Gas Corporation—909-miles total line now laid

Contracts with the gas producers provided that 100 miles of main line between the gas fields and Birmingham should be completed before July 15, and to be completed and operating at least as far as Birmingham by December 31. The first contracts were therefore let to Oklahoma Contracting Company and Williams Brothers on May 7 to cover the 100-mile requirement, and additional contracts were later made for the balance of main line with Oklahoma Contracting Company, Hope Engineering Company and Williams Brothers.

All requirements for completion dates were met, and first gas being delivered in the Birmingham area December 31. Deliveries to Atlanta will commence about January 25.

During the course of construction additional contracts were made with Vicksburg Gas Company for supply to Vicksburg, Mississippi, with Mississippi Power & Light Company for supply to

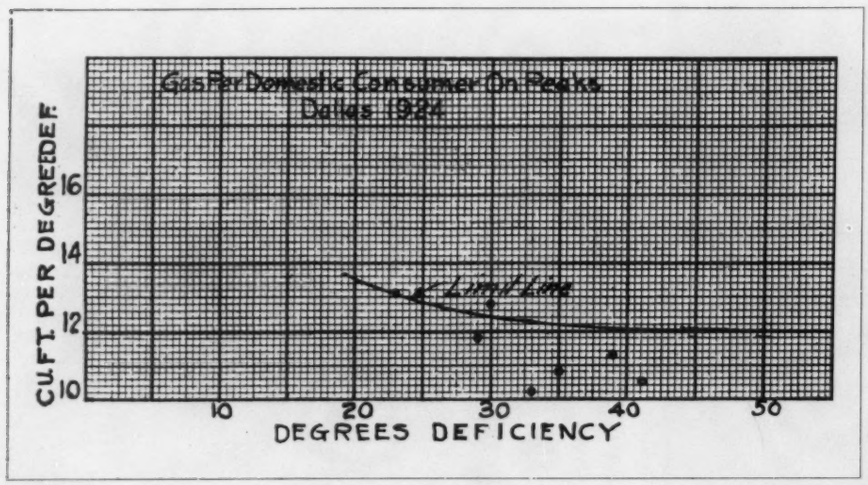


Fig. 1

Jackson, Canton, Durant, Yazoo City and Canton, Mississippi, and with Birmingham Gas Company for part of the supply for Birmingham, Alabama (balance being coke-oven gas produced locally).

The industrial load is of a varied nature. In the Birmingham area it is composed largely of steel plants, brick and tile plants and lime burning plants; in Gadsden area, steel plants and foundries; in Atlanta steel plants and small manufacturing and brick plants; in the Rome, Georgia, area textile plants, smelting and small manufacturing; in Mississippi, brick plants; in the Macon, Georgia, area, pottery, tile and brick plants. Cement plants in the Birmingham area have not proven desirable business on account of the low price of powdered coal in use. The system as initially constructed is connected to cities and towns of nearly 1,000,000 population, of which 150,000 have previously had no gas service of any kind. Extensions planned will connect to additional populations of over 250,000. Affiliated companies propose to build distribution systems in 40 cities and towns in Mississippi, Alabama, and Georgia.

TABLE OF DISTANCES

of Lines Included in Initial Construction Program

Monroe Field to Birmingham	317.6
Monroe Field to Atlanta	461.1
Miles 22-inch	284.7
Miles 20-inch	176.4
Miles 18-inch	33.5
Miles 12-inch	70.2
Miles 10-inch	35.5
Miles 8-inch	43.5
Miles 6-inch	125.5
Miles 4-inch	121.1
Miles 3-inch	78.6
Total Mileage Initial Program	909.0

One compressor station was built at Reform, Alabama. It consists of four 24 x 36—1200 H.P. Worthington gas engine driven twin tandem units. No compression is required at present for Richland field gas. Arrangements were made with Mississippi River Fuel Corporation to compress Monroe Field gas for Southern Natural Gas Corporation for two years so that construction of Southern's Monroe Field compressor station might be deferred. Additional main line stations are contemplated as the business develops at Onward and Pickens and Louisville, Mississippi, Birmingham and Anniston, Alabama.

Pipe used has been of three classes. On some branch lines a new type of electric fusion welded pipe was used, this pipe being furnished in 40-foot lengths. On the main lines the pipe was plain end lap welded steel, furnished by National Tube Company, random lengths plain end, or electric welded steel, furnished by A. O. Smith Corporation. A minimum factor of safety of four was used in determining the pipe wall thickness, giving due account to the ultimate strength of the respective pipe materials and the respective efficiencies of longitudinal welds. The line is designed for 400 pounds operating pressure.

Welding was freely resorted to on main line in locations when stability of the line would be endangered by the use of couplers, but otherwise the line was laid as a coupler line, using Dresser couplers. Much of the branch lines 12 inches and smaller were laid welded, using the oxy-acetylene process.

Particular attention has been given to the question of stability of the line at bends. In the hills near Yazoo City, Mississippi, and in the Birmingham area, overbends were frequent and the thrusts developed in a large line at high

ILLUSTRATIONS BELOW

Some of the equipment which went into the Southern Natural Gas Corporation's 909-mile gas carrier from Louisiana fields to population centers of Mississippi, Alabama, and Georgia

UPPER:

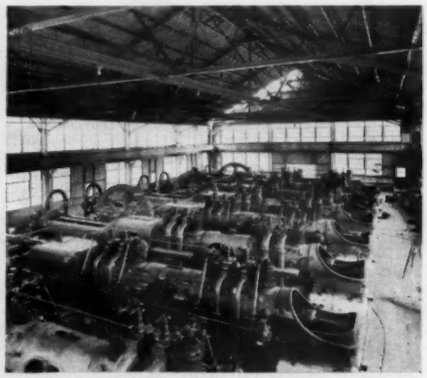
Power ends of compressors, Reform Compressor Station, Reform, Alabama. View taken December 1, 1929

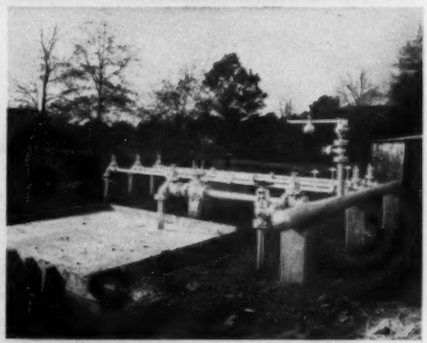
CENTER:

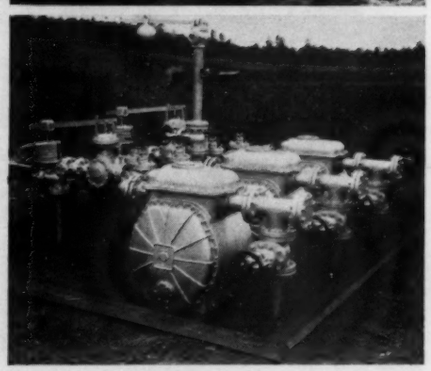
Regulator and orifice meter piping at Oxford, Alabama, before erection of building. View taken December 12, 1929

LOWER:

Triple positive displacement high pressure meter and regulator installation (before erection of house), at the Stephenson Brick Plant, Lovick, Alabama, on a lateral from the main transmission line. View taken December 2, 1929







pressures are far beyond anything the pipe laying foreman usually conceives. On a bend the thrust that must be resisted by the backfill, trench wall, thrust blocks or whatever is relied upon to produce stability is equal to

$$P \times D^2 \times .7845 \times 2 \times \text{Sin } \tfrac{1}{2} \text{ Angle of Deflection.}$$

For a 22-inch O.D. line working at 400 pounds pressure this becomes, for an angle of 20° about 63 tons, and requires something more powerful than three feet of loose soil to withstand it. In general the sharp overbends were given at least five feet of cover and were reinforced with concrete thrust blocks and a joint or more welded on each side of the bend. All side bends were reinforced by concrete thrust blocks.

The question of protection of the pipe against corrosion was given careful consideration. A soil survey was conducted to determine general soil characteristics but on account of lack of time sampling was not done at frequent enough intervals to base the policy entirely on this survey. Since a wide variety of soil conditions was encountered in the great distances traversed, some variety in protection was resorted to. In Louisiana it is quite generally recognized that soil in which scrub palmetto grows is seriously corrosive to steel pipe, and its presence is sufficient warning that the greatest precautions are desirable. It is also generally recognized that corrosion is likely to be serious in any area where drainage is poor and where rainfall disappears by evaporation and seepage rather than by run-off. In such areas hot bituminous applications were resorted to on the line. In areas where drainage was good and corrosion not likely to be severe, less expensive cold coatings were used. All pipe received priming coat at the mill and none was laid without additional field coatings.

A telephone line runs the full distance of the main line from the fields to Atlanta. This line is two-wire line on brackets. No. 8 copper, with submarine cable across the Mississippi River. Transpositions varied from two to four per mile, depending upon the proximity to interference. Normal spacing was 175 feet, 30 poles per mile, sag 18 inches. Poles were 20 feet long by 5-inch to 6-inch tops, creosoted.

As an aid in location of lines, aerial photography proved of great value, both in speed and economy. Strip maps about 9,000 feet wide on a scale of 1,000 feet to the inch were taken across terrain where location was easily made, and in difficult terrain mosaic maps on a scale of 1,000 feet per inch were used to determine location. Survey and line location was under the direction of E. C. McGee after preliminary general location by J. E. Devine and P. M. Biddison.

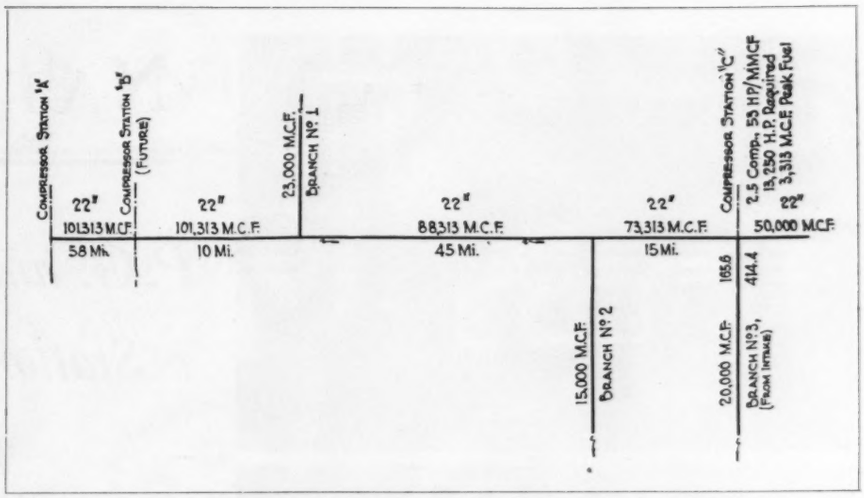


Fig. 2

FORM NO. 1. PRESSURE CALCULATIONS

	Pressure Gage	Pressure Abs.	Square of Absolute Pressure or Difference in Squares
Inlet to Station C	151.2	165.6	27,450
$\frac{(73313000)^2}{(3000000)} \times 15$ = Drop Station C to Branch No. 2			8,950
At Branch Connection No. 2	176.3	190.7	36,400
$\frac{(88313000)^2}{(3000000)} \times 45$ = Drop Branch No. 2 to Branch No. 1			39,000
At Branch Connection No. 1	260.0	274.4	75,400
$\frac{(101313000)^2}{(3000000)} \times 10$ = Drop Branch No. 1 to Station B			11,400
At Station A (Station A Postponed)	280.4	294.8	86,800
$\frac{(101313000)^2}{(3000000)} \times 58$ = Drop Station B to Station A			66,200
At Station A Discharge	377.0	391.4	153,000
At Station A Inlet 2.5 Compressions	132.2	156.6	24,750

The peak loads were determined by an analysis of the markets to be served. This analysis showed that by the great diversity of industrial business a load factor of from 75 per cent to 80 per cent could be obtained on that class of business. Its peak load is therefore the average daily load of such business divided by load factor. On the domestic load it was estimated that in the cities having sewage systems and modern homes that the coincident average peak daily load for cooking and water heating would within five years reach 100 cubic feet per consumer per day and about 90 cubic feet per day for small towns. For the peak day load for house heating comparisons were made from data compiled by R. M. Redding of Dallas Gas Company, which showed that the fuel consumption in cubic feet per consumer per degree day deficiency for Dallas was less on the colder days of the year than the average for the year and in fact declined with temperature (See chart, Figure 1). On the basis of these data a peak day for heating load was computed at 12 feet per customer per degree day deficiency for a deficiency of 50 degrees on maximum day (15 degrees, minimum temperature). This heating load of 600 feet per day peak plus cooking and water heating peak gives domestic peaks of 690 to 700 feet per customer per day, and with event-

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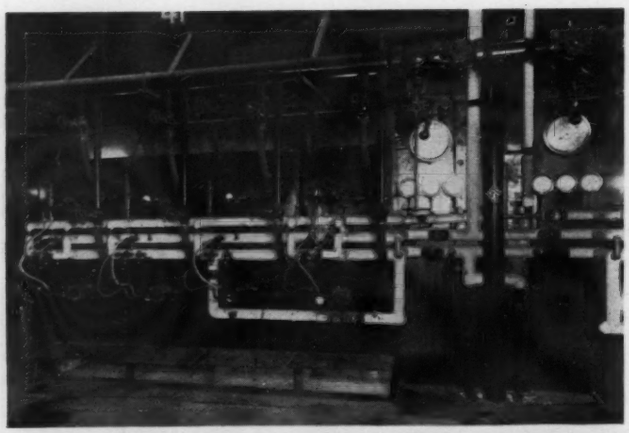
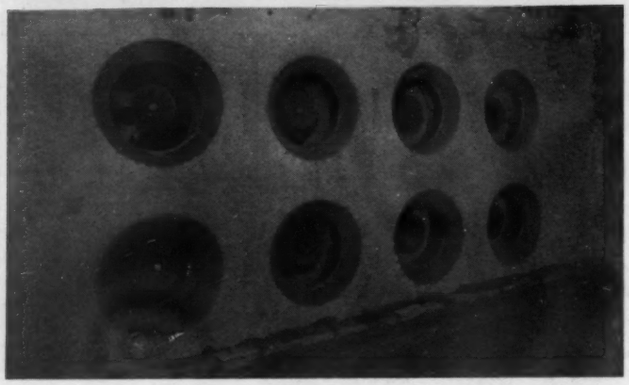




UPPER: Close up of gas-fired boiler at Station A—Potrero plant, P. G. and E., San Francisco. Detail of burners and pressure gages for gas, oil and steam is shown. White insulated lines are for stand-by oil burning equipment and steam.

LOWER: Inside of firebox.

NATURAL GAS IN

P.G. and E. Steam-Electric Stations Equip for Gas

By C. H. DELANEY

Engineer, Electrical Department
Pacific Gas and Electric Company

EVERYONE in touch with economics of the electrical industry realizes the growing importance of steam electric generation as contrasted with hydro-electric power production. It is also becoming recognized that natural gas fuel, when it can be obtained for the purpose, outbids all rival fuels for use under power plant boilers.

In the pages immediately following, ***Western Gas*** presents the experience of two utilities, widely separated in distance, with natural gas for power station use. The Pacific Gas and Electric Company, to which natural gas has just become available, is substituting this fuel for oil at a number of its power generation stations. The Dallas Power & Light Company has behind it six years of experience with natural gas. Authors of these two articles discuss boiler layout and burner installation, touching upon many problems incident to use of gas in this important application.—*Editor.*

WHEN natural gas was brought into the San Francisco Bay region it was natural that the first large consumer should be the steam electric power plants. These plants are mainly standby plants for the hydro-electric system and operate at rather extreme load conditions, at times running at almost zero load and at other times operating for months at a time at maximum output.

C. H. Delaney

Station "A," San Francisco, at the time the natural gas was brought in was equipped with 30 boilers varying in size from 500 to 890 H.P. Owing to prospective changes in the station involving its increase in capacity from 57,000 kw. to ultimately 200,000 kw., a number of these boilers were shortly to be removed to make room for new equipment. It was decided to equip for gas burning only the boilers that would remain in the plant for some years to come. Forney combination gas and oil burners were therefore installed in eight 823 H.P. Stirling boilers and one 524 H.P. Babcock and Wilcox Boiler.

These boilers were formerly fired with fuel oil by means of steam atomizing burners located at the bridge wall shooting the fire forward. In order to provide for gas burning, it was necessary to change this arrangement and install combination burners in the front wall. In rebuilding the Babcock and Wilcox and the Stirling boiler furnaces for the new burners the furnace floors are supported on "I" beams across the old ash pit dividing walls. Four-inch pipes under the furnace floors are provided for ventilation, to prevent overheating of the floors. In the combination burner selected the gas as well as the oil leaves the burner tip from a central point in the shape of a cone. The air for combustion enters around the cone of gas or oil, producing an intimate mixture of fuel and air, thus insuring complete combustion. With this type of burner, it is possible to change from one fuel to the other merely by removing the gas burner and inserting the oil burner, or vice versa. This is a very essential feature, as it is necessary to maintain the output of the station whenever it is required, and if the gas supply should fail for any reason, such as shutting down the pipe line for repairs, it is essential to be able to quickly change over to oil burning.

At Station "C," Oakland, a modern turbine operating at 450-lb. pressure was installed in 1928. This turbine is supplied with steam by two large boilers of 3400 H.P. each. The station also contains two smaller turbines supplied with steam by 12 boilers of about the same size as the boilers at Station "A," San Francisco. Since the new turbine is much more economical to operate than the older turbines, it is operated continuously and carries the bulk of the load, the other two turbines being operated only occasionally when load conditions require. It was decided to equip for gas burning only the two large boilers supplying steam to the new turbine, as it was felt that the older equipment would not be operated sufficiently to warrant the expense of the change over.

The two large boilers at the Oakland station were formerly equipped with

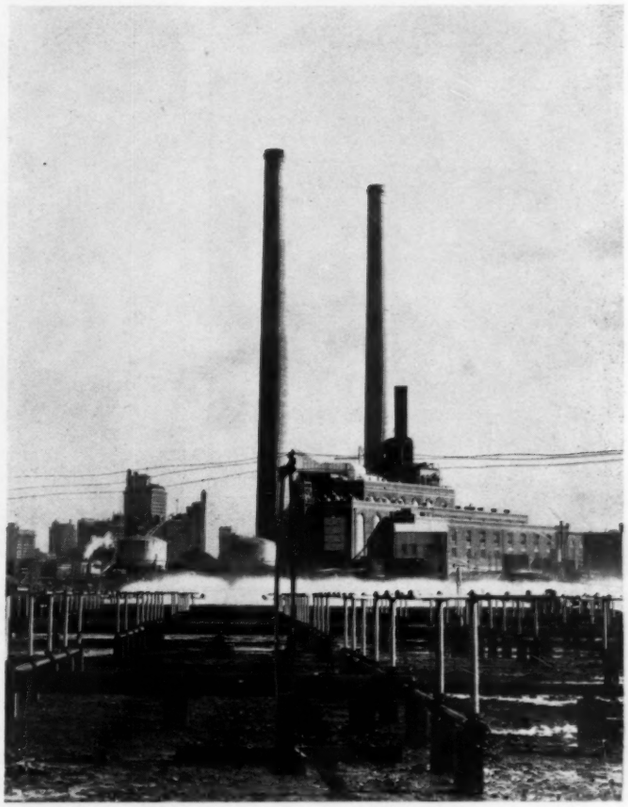
(Continued on Page 59)

THE POWER PLANT

Gas Lowers Unit Costs for Dallas Power & Light

By MILTON F. MERL

Assistant Efficiency Engineer
Dallas Power & Light Company



The two 350-foot smoke stacks on this Dallas Power & Light station are each capable of delivering over 8,000,000 cubic feet of flue gas per hour. In foreground, part of newest addition to the world's largest spray pond for cooling condenser circulating water.

GAS men who read Mr. Merl's comments upon use of natural gas under power plant boilers at Dallas are in for something different in the line of discussions on industrial gas applications. While the author has no doubt that gas is the ideal fuel for his purposes, he speaks out definitely on various problems which face the power station in using gas. He is interested primarily in what the gas company can do to effect 100 per cent service in translating fuel into kilowatt hours, and *Western Gas* readers should not miss the opportunity to get this direct consumer viewpoint.—*Editor.*

Milton F. Merl

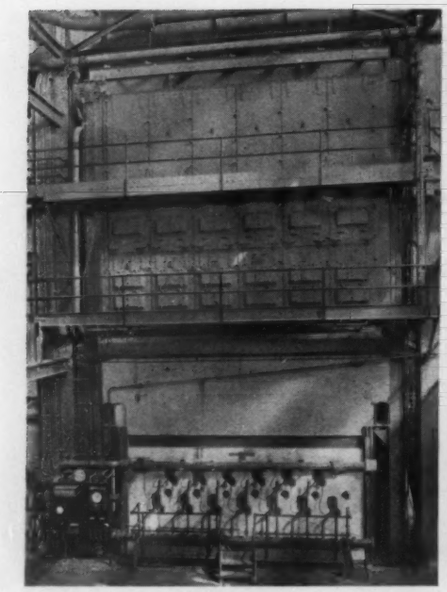
SINCE the leaders in the gas industry are not always in a position to appreciate the troubles encountered in the use of the commodity which they are busily engaged in marketing, it is desired to present to these men some of the trials and tribulations which beset the power plant man who uses natural gas for fuel. During the past six years the Dallas Power & Light Company has used natural gas as its principal fuel in the production of electrical energy and it is from the experiences of these years that the facts herein are set forth.

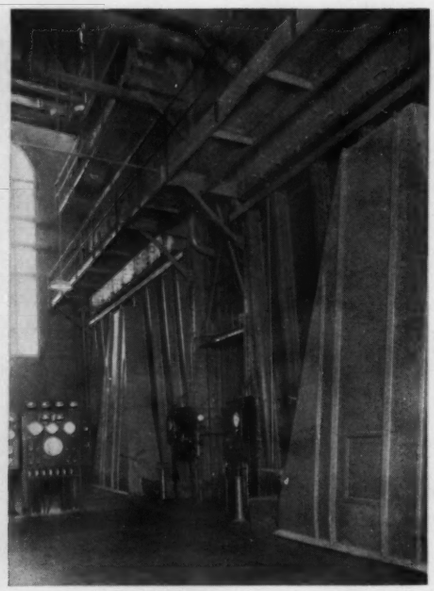
In order that the position of the power plant consumer may be more readily understood, it might be well to familiarize the reader with the equipment which comprises the power plant. The Dallas Power & Light Company is now completing a $2,850,000 extension to its main generating station, which will increase the capacity to 82,500 kilowatts. With the completion of this extension, the equipment will include three turbo-generator units and six boilers of ultra-modern design and two turbines and six boilers which were the best available a decade and a half ago. The last named equipment comprises the old plant and is used for standby purposes only. Of the three turbines, one has a capacity of 20,000 kilowatts, while the other two each have a capacity of 25,000 kilowatts. Steam is supplied to these turbines at a gage pressure of 340 pounds per square inch and at a temperature of 725° Fahrenheit.

The boilers are of the cross-drum type and were manufactured by the Babcock and Wilcox Company. Four of them are rated at 1,700 boiler horsepower, each having a combined water tube and super-heated heating surface of 19,400 square feet and a combustion space of 5,500 cubic feet. Normally, these boilers are operated at 200 per cent of rated capacity, during which time heat is liberated in the furnace at a rate of 25,160 B.t.u. per cubic foot of furnace volume per hour. The other two boilers are rated at 1,440 boiler horsepower, having a combined water tube, water wall and superheater heating surface of 18,000 square feet and a combustion space of 5,750 cubic feet. A heat liberation of 34,170 B.t.u. per cubic foot of furnace volume per hour takes place during the normal operation of the boiler at 300 per cent of rated capacity. These two boilers are equipped with the regenerative type of air preheaters, resulting in an increase in their efficiency of approximately 9 per cent. The daily efficiency of these six boilers will average about 78 per cent. All the boilers are equipped with the Forney combination gas and mechanical atomizing oil burners. These burners were installed because it was found that they were rugged, very reliable, and that their use resulted in the highest possible combustion efficiency.

To conduct the flue gases away from the boilers, two massive concrete smoke stacks 350 feet in height are provided. These stacks deliver the invisible flue gases from the boilers at the rate of over 8,000,000 cubic feet per hour. On a clear cold day steam at the rate of 72,000 pounds per hour can be seen issuing from these stacks. This steam is the result of the chemical combination of the hydrogen in the natural gas with the oxygen in the air supplied to the fuel.

There are a number of considerations to be taken into account when selecting a fuel for a power plant, among which are initial cost, cost of transportation, reliability of supply, nearness of the source of the supply, cost of prepara-





LEFT: A gas-fired boiler which will consume as high as 13,200 pounds of natural gas per hour. To burn this gas 110 tons of air, preheated at 500° Fahr., are required. Under these conditions a furnace temperature of approximately 2500° is maintained. RIGHT: Two 1700 H.P. gas fired boilers.

tion for combustion, ease of operation, cleanliness, safety, and resultant boiler efficiency.

Texas has an abundant supply of three fuels, namely, lignite, fuel oil and natural gas. Lignite, in Texas, is cheap and may be burned in pulverized form or on stokers. Due to its high moisture content, it must be dried before pulverization. Both the drying and pulverization result in an expense which tends to overshadow the low first cost of the fuel. Only in a few instances has lignite been successfully burned on stokers. This fuel crumbles very easily and the loss due to some of it passing through the tuyeres to the ash pit is considerable. In addition, a certain amount of auxiliary equipment is necessary to drive the stokers. The problem of storage enters with the use of lignite. Due to its crumbling characteristic, it is a fuel which is hard to store. Also, stored coal represents a potential source of spontaneous combustion, especially when the coal is fine. Where lignite is pulverized, care must be taken to prevent explosion due to the ignition of collected dust.

Mineral fuel oil has several advantages over the use of coal in a power plant. For equal weights of the two fuels, fuel oil has a heating value approximately 35 per cent higher than a high grade coal, and for equal heating values, oil requires about 50 per cent less storage space. Due to there being no ash or refuse, less boiler room labor is required. With the use of oil, there is a greater adaptability to variation in load and there is no loss in heating value due to deterioration during storage. Normally, oil can be burned with a higher efficiency than can either gas or coal. To offset its advantages, insurance liability is usually higher for oils than for solid fuels, furnace maintenance is usually higher, and there is an extreme fluctuation in cost.

Where the cost is not prohibitive, gas is the ideal fuel for power plant use. It permits the keeping of an extremely clean boiler room, it can be used with a high degree of flexibility in carrying a fluctuating load, no auxiliary equipment or storage facilities are needed, the minimum amount of boiler room labor is required, and it can be burned with high efficiency.

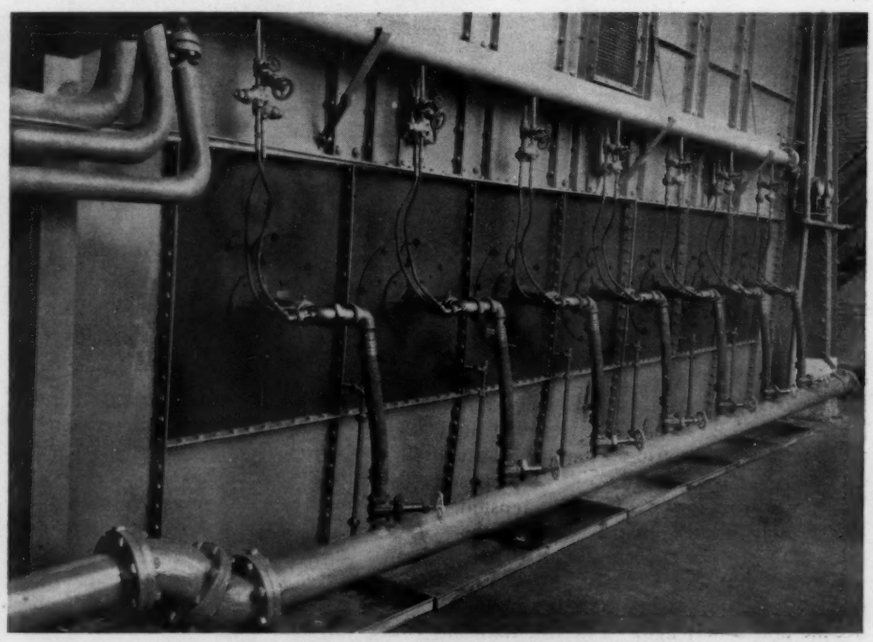
In addition to having the several named advantages over both oil and coal, it was found that the use of gas as the principal fuel would result in a lower unit cost per kilowatt hour plant output. In the end, it is the cost per unit of production which determines the selection of any fuel. However, as the Dallas Power & Light Company is a public utility and as such must serve the public to the best of its ability, oil is used as a stand-by fuel. With a few minutes notice, all the boilers may be switched from gas to oil should the gas supply fail.

GAS ANALYSIS

The gas which is used at this plant is supplied by pipe line from the Alto and Richland fields of Louisiana and the Panola field of Texas, through the mains of the Latex Gas Company, a subsidiary of the Magnolia Gas Company of Dallas. It is composed of 94.4 per cent methane, 2.9 per cent ethane, 0.2 per cent carbon dioxide, 0.2 per cent oxygen and 2.3 per cent nitrogen, and has a heating value of approximately 1000 B.t.u. per cubic foot.

This gas is burned under all boilers, the pressure at the burners being between 2 and 20 pounds per square inch, depending upon the rate of steaming of

(Continued on Page 60)



The Forney combination gas and oil burners used with the 1700 H.P. boilers illustrated above.

Employee Suggestion Plan Produces Ideas *for* Empire Companies

By Q. R. DUNGAN
Secretary, New Suggestion Committee, Empire Companies

ON July 1, 1926, "The Empire," employees' paper of the Empire Companies, carried an announcement by H. R. Straight, vice-president and general manager, of the inauguration of the "Employees Suggestion System." Attention was called to several subjects for suggestion, such as:

Improvement in service to our customers.

Improvement and extension of Public Relations.

Improvement in apparatus, tools and methods.

Improvement in attractiveness and appearance of property.

Improvement in safety devices.

Improvement in plant or office appliances.

Reduction of expenditures without lowering standard of service affecting amount of additional or new business to be secured.

Lowering unit cost without reducing production.

Increasing production without increasing unit cost.

Savings in material through improved methods.

Elimlnation of duplication, resulting in savings of materials, time or labor, without impairing safety or service.

Reduction of accidents to employees and the public.

PREVENTION OF FIRE HAZARDS

All employees were urged to record their new ideas and to submit them to a Central Suggestion Committee composed of the Chief Engineer, Assistant Secretary and Assistant Treasurer. This Committee refers the suggestions to the departments or divisions in which work is affected, with a request for consideration. If the suggestion is approved, the department or division is asked to recommend the amount of the award, or to estimate the annual savings or increase in revenue to be derived from the use of the suggestion, and the award is based on this.

The schedule of awards was as follows:

For routine awards, $5 to $50, according to the value of the suggestion.

Two quarterly awards, $15 and $10, for the two best suggestions. Three annual awards, $100, $75 and $50 for the three best suggestions of the year.

Early in 1929, the method of submitting the suggestions and the award schedules were revised for the purpose of obtaining more suggestions and better rewarding the employees submitting them. A suggestion blank was sent out with each pay check, together with an explanation of the revised procedure. The suggestion blank had a detachable stub which bore a number the same as that on the blank. The employee then submitted his suggestion by number, retaining the stub for identification. No names were known until after the suggestion had been considered and the award approved. The maximum limit on the routine awards was eliminated, thus allowing any amount commensurate with the value of the suggestion. The quarterly awards were eliminated and the annual awards remained unchanged.

Publicity in connection with the Suggestion System is essential. At present, all suggestions received are acknowledged through "The Empire." Those which are approved are listed with a request that the signed stub be forwarded to the Committee. Those not approved are listed with a brief but comprehensive explanation for each one of why it was not accepted. The suggestions accepted and paid for are also listed with the name of the employee, his department and location, together with a write-up of the suggestion. In this way, others may make use of the suggestion, as the explanation is usually complete enough. If further information is desired it can be obtained from the Committee, which will send out a complete copy of the suggestion with copies of all drawings and diagrams submitted. In many cases, photographs and diagrams are given in "The Empire," so that the use of the suggestion may be as widespread throughout the company as possible.

The employees of the company's Gas Division were quick to take advantage of the opportunities offered through the Suggestion System. A Gas Division Committee was formed to pass on the suggestions relating to gas operations. This Committee is composed of a representative of each of the departments, such as production, compressor station, transportation, and meter department. Suggestions are passed on in a meeting of the entire Committee, at which time a complete discussion of the idea is had and its value determined.

Suggestions are not confined to the subject of the employee's work, or even to his own division. The employees are urged to constructively criticize any operation, procedure or condition of any part of the company's activities which may come to their attention. This opens a very broad field to the Gas Division employees. Naturally, Gas Division operations will claim their first attention, but their contact with the work of the public relations, customer ownership, service and office departments, as well as the other operating divisions, offers ample opportunity to the observing and thinking employee.

Illustration of the foregoing statement may be had by a review of some of the suggestions received from Gas Division employees. These include:

A Gage clock hub puller.
Oil separator for Cooper engines.
Gas conservation bull plug.
Public relations article for newspapers.
"Coupling buster."
Hot water gas line heater.
Standard diagram and designation of meter parts.
Cover for rising stem gate valve.
Ignitor terminal.
Automatic door stop.
Jig for grinding valves.
Remedy for frozen flash-back.
Standard gage box fitted with gages and supplies.

In the three and one-half years of operations, about 40 suggestions from Gas Division employees have been accepted and put into use. The employees have received about $1,000 in awards and prizes, and the company has benefited through increased efficiency, improved safety, and a more alert personnel.

The success of the system has been the product of ambitious employees, the publicity given the system and suggestions, and 100 per cent cooperation from the general manager down to the chart-hanger and office boy.

This truck is aiding a special sales crew of the Community Natural Gas Company in its intensive drive on Pittsburg Water Heaters over the Community's Texas system. The calliope mounted on the truck drew attention to the sales event, while several models of the Pittsburg line, seen on the rear end of the truck, were available for first hand inspection by the customer

Selling Water Heaters *by* Specialization

By CRAIG ESPY

Mid-Continent Manager, Western Gas

THE Community Natural Gas Company of Dallas, affiliated with the Lone Star Gas Company, and serving gas to more than 200 cities and towns in Texas and Oklahoma, is practising specialization in connection with a water heater campaign which is being conducted over its system; specializing in the sense that six men chosen from the company's sales department go from town to town to put the campaign on, instead of having the sales force local to each town, conduct the campaign.

To point out the advantages of such a procedure is to list the advantages of any form of specialization. The six men that the Community chose were men of general sales experience. Now they are water heater specialists; have become adept at water heater sales; are intimately familiar with their product, and know how to sell it to the prospect.

The sale has been conducted in the Bonham and Greenville, Texas, districts of the company, and bids fair to be put on in all of the towns of the Community system.

A joint feature of the sale is the use of a calliope and truck provided by the Pittsburg Water Heater Company. Whereas calliopes usually bid villagers join a parade to the high-top circus tent, this calliope heralds the water heater sale in the Community town.

The calliope is mounted on the body of a 5-ton truck shown above and the truck also bears the water heaters being featured in the campaign. Banners announcing the special water heater sale, and displaying the name of the gas company, appear in prominence.

The truck and calliope hunt out every nook and corner of the town, by way of announcing to the public the arrival of the hot water heater specialty crew, and the inauguration of the local water heater sale. Immediately following this each house-wife in the town is given a hand-bill announcing the terms of the sale.

The Community first utilized boys in handing out these bills, but gave up this method for the plan of having the six salesmen themselves distribute the hand-bills.

To make this feasible and also to make possible the most rapid and systematic progress in connection with the working of the town, arrangement is made with each local manager to divide the town in three districts prior to the arrival of the crew of six. On arrival the men draw for their districts. In this way it is a matter of chance whether they get the first, second or third best district in the town.

The two men assigned to each district are given the help of a local gas man in distributing the hand-bills. The local man drives his automobile down each street while the two crew men go to each door with the bills. If the housewife is at home she is given the hand-bill personally, with a few comments from the salesman—about "our calliope—did you hear it," etc. It was found that in this way prestige is created for the sale, and that each hand-bill receives the attention of the housewife.

Following the thorough distribution of the handbills, the sales work in each town begins in earnest.

While the idea of the campaign was yet young, during the first few days of its operation, the men in each district worked singly. Later it was found that by working in pairs, two men to the prospect, that the sales visit was made more impressive and more productive of immediate results.

If the housewife states that she has to secure the permission of her husband to make a purchase, the husband is immediately sought out by the two salesmen, in whatever part of town he happens to be. If consent to install the heater is not won from him, a call back at night is necessary, this call back is made by only one man.

The special sales workers make out prospect cards on each call, which are left at each local gas office for follow-up work. The crew also follows the practice of returning to a town before leaving a district, providing there are sufficient call-backs of a definite nature to make the trip seem justifiable.

S. E. Kerr, commercial manager of the Community, points out that this specialized type of sales work is of such

(Continued on Page 62)

PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California
A Department Conducted by Clifford Johnstone, Managing Director

Commercial Meeting - February 6-7

Frank Weiss

AS announced last month, the Commercial Conference is being held February 6 and 7 in Los Angeles, under the chairmanship of Frank Weiss. Sessions convene in the auditorium on the 12th floor of the Los Angeles Gas and Electric Corporation building.

The program follows:

Thursday, February 6
9:30 A.M.

Paper: "Heat Treating," Jas. H. Knapp, James H. Knapp Company.
Paper: "Drawing of Steel," E. M. DeRemer, Southern California Gas Company.
Paper: "Cutting of Steel," J. R. Warrack, Southern California Gas Company.
Paper: "Case Hardening," Frank Carter, James H. Knapp Company.
Paper: "Restaurant Conversions," D. J. Bartelme, Pacific Gas and Electric Company.

12:15 Noon

Group Luncheon in Auditorium—F. H. Bivens presiding.
Speakers: W. M. Henderson, H. W. Geyer—"Conversion Burners."

In the afternoon transportation will be furnished for all members to the Natural Gas Bureau Exhibit, 815 E. Washington. N. R. McKee will be in charge of transportation arrangements. All exhibitors will be present and there will be a demonstration of steel cutting by J. R. Warrack

Friday, February 7
9:30 A.M.

Progress reports by committee chairmen—Open discussion.
Paper: "Gas Refrigeration," C. M. Grow, Southern California Gas Company.
Paper: "Domestic Sales and Trend of Conditions." F. H. Bivens, Southern Counties Gas Company.

A number of committee sessions have been arranged for Friday afternoon.

Mid-Winter Technical Session

ON THIS page of *Western Gas* for January, dates for the Mid-Winter Conference of the Technical Section were given as February 6 and 7, due to typographical error. Correct dates for the conference are February 20 and 21. The meeting will be in Los Angeles, at the L. A. Gas and Electric Corporation building, 810 South Flower Street.

Wm. Moeller, Jr.

An excellent program is in process of preparation for the Technical Conference, several papers having been arranged. A series of committee meetings will be held during the two-day session. Wm. Moeller, Jr., general chairman of the Technical Section, assisted by W. M. Henderson, chairman of the Distribution Committee; W. A. Bahr, chairman of the Production Committee, and M. R. Thompson, chairman of the Natural Gas Committee—is arranging program details.

It is planned to hold separate sessions for each of the three committees named above, in charge of their respective chairmen.

Detailed announcement of program events for the February 20 and 21 conference will be mailed members direct from Association headquarters.

Edward A. Rix Passes

EDWARD A. RIX, president of the Rix Company of San Francisco, and one of the early members of this Association, passed away in Oakland on January 8, 1930, after an illness of several years.

Mr. Rix became a member of this Association in 1905 and at the Thirteenth Convention, in that year, presented a thesis on "The Compression and Transmission of Gas." The following year at the Convention he presented another thesis entitled, "Some Economics in High Pressure Gas Transmission." These two papers in 1907 were printed in booklet form by the Pacific Coast Gas Association, and Mr. Rix received the Association's Gold Medal in recognition of his excellent presentations.

Gift from E. C. Jones Adds to P. C. G. A. Archives

A RECENT letter received from E. C. Jones, the father of the Pacific Coast Gas Association, will be of interest to Association members. Mr. Jones is now living in retirement in Palo Alto, but as his letter shows, still maintains his interest in the Association. Mr. Jones was elected to honorary membership in the Association in 1922.

The draft of the Constitution which Mr. Jones has donated is in his own handwriting, and was adopted at the first meeting of the Association, held July 11, 1893, without change.

Mr. Jones' letter follows:

530 Kellogg Ave.,
Palo Alto, California.

Mr. Clifford Johnstone,
Managing Director,
Pacific Coast Gas Association,
San Francisco, Calif.

Dear Mr. Johnstone:

In looking over some old papers I ran across the copy of the first Constitution and By-Laws under which the Pacific Coast Gas Association was organized. I remember distinctly the smile of amusement on the face of our first President, Mr. J. B. Crockett, when I attended the first meeting with the name of the Association, the seal of the Association and the Constitution and By-Laws all prepared. When he remarked that it was a little unusual I replied that it would save time.

I am sending to you enclosed the draft I made, but one page is missing (the last page of the By-Laws). It is curious that the Constitution and By-Laws did not appear in print in the first volume of Proceedings 1893-1897. It was probably an oversight of the Secretary or Editor.

I am sending the old paper with the thought that somebody, sometime, might have a sentimental interest in the beginnings of the Association.

With kindest regards and best wishes,
Sincerely,
(*Signed*) E. C. JONES.

Commercial Section Sub-Committees

FOLLOWING the plan which has been found so successful by the Technical Section during the past year, the Commercial Section has approved an organization whereby the Domestic Sales and Industrial Sales Committees will be permanent committees continuing from year to year with but small change in personnel. Under each committee there will function a number of sub-committees assigned to a particular problem. The number, character and personnel of these sub-committees will of course vary from year to year, depending on the studies thought desirable by the Section Executive Committee.

The sub-committee personnel for the present year is as follows:

DOMESTIC SALES

R. W Coblentz, Chairman, Washington Gas & Electric Company

Cooking

Sidney Beck, Estate Stove Company
W. L. H. Geldert, Southern Counties Gas Company
A. P. Stryker, Pacific Gas and Electric Company
E. J. Hinchey, Jas. Graham Mfg. Company
C. Roy Ohnimus, Hammer-Bray Company
Andrew Kerr, Steiger & Kerr Stove & Foundry Company
F. W. Schwab, Tappan Stove Company
H. B. McLaughlin, Coast Counties Gas and Electric Company

Water Heating

O. R. C. Grow, Chairman Southern Counties Gas Company
L. Cinq-Mars, Pacific Gas Heating Company
C. H. Dickey, Jr., Hot-N-Kold Corporation
W. M. Gahan, Coast Counties Gas and Electric Company
M. C. Hancock, Washington Gas and Electric Company
S. R. Hutchinson, Seattle Lighting Company
W. F. Suess, Southern California Gas Company
H. M. Thomas, Northwest Cities Gas Company
Geo. Egleston, H. R. Basford Company

House Heating

A. C. Miller, Chairman Pacific Gas and Electric Company
H. P. Dockstader, Pacific Gas and Electric Company
A. L. Spring, California Servel Company
F. M. Banks, Southern California Gas Company
Rudolph Jenny, Pacific Gas and Electric Company
W. M. Kapus, Northwest Gas and Electric Equipment Company
Guy R. Kendall, Northwest Gas and Electric Equipment Company
Ed Marshall, Madera Gas Company
W. M. Norton, Electrogas Furnace Company
John Redd, Los Angeles Gas and Electric Corporation

INDUSTRIAL SALES

Ray Trowbridge, Chairman, Pacific Gas and Electric Company

Restaurant and Institutional Sales

D. L. Leahy, Chairman, Southern Counties Gas Company
Wm. B. Marks, Pacific Gas and Electric Company
D. J. Bartelme, Pacific Gas and Electric Company
Wm. Duggan, Northwest Gas and Electric Equipment Company
Geo. Heckler, Southern California Gas Company
I. L. Heckinger, Pacific Gas and Electric Company
A. A. Knoernschild, Seattle Lighting Company

Non-Ferrous Metals

C. A. Thorp, Chairman, Los Angeles Gas and Electric Corporation
F. C. Dietrich, Pacific Gas and Electric Company
J. F. Aicher, Pacific Gas and Electric Company
E. B. Morey, Southern Counties Gas Company

Ferrous Metals

Geo. Bowersox, Chairman, James H. Knapp Company
James Warrock, Southern California Gas Company
James Knapp, James H. Knapp Company
Franklin Carter, James H. Knapp Company
C. A. Thorp, Los Angeles Gas and Electric Corporation
E. M. De Remer, Southern California Gas Company

Food Products

Geo. Heckler, Chairman, Southern California Gas Company
John Redd, Los Angeles Gas and Electric Corporation
E B. Morey, Southern Counties Gas Company

Electrical and Chemical

Herbert Haas, Chairman, Pacific Gas and Electric Company
Robt. Carver, British Columbia Electric Power and Gas Co., Ltd.
C. A. Thorp, Los Angeles Gas and Electric Corporation.

Ceramics

E. M. De Remer, Chairman, Southern California Gas Company
C. L. Ferry, Southern Counties Gas Company
C. B. Pattison, Pacific Gas and Electric Company
Ross Van Gundy, Pacific Gas and Electric Company
C. A. Thorp, Los Angeles Gas and Electric Corporation

Varied Industries

Arthur O. Leech, Chairman, Portland Gas & Coke Company
W. W. Fitkin, Southern Counties Gas Company
A. A. Knoernschild, Seattle Lighting Company
R. J. Phillips, San Diego Consolidated Gas and Electric Company
Harry Warren, Southern California Gas Company

Natural Gas Conversions

K. B. Anderson, Chairman, Coast Counties Gas and Electric Company
O. B. Dickson, Pacific Gas and Electric Company
Chas. Ferry, Southern Counties Gas Company
Allen T. Fesler, Santa Maria Gas Company
H. H. Foreman, Southern California Gas Company
H. C. Ross, Pacific Gas and Electric Company
C. A. Thorp, Los Angeles Gas and Electric Corporation

Boilers, Mixed Gas Applications

Chas. Carlson, Chairman, Pacific Gas and Electric Company
Frank Beardsley, Coast Counties Gas and Electric Company
Wm. Hand, Southern California Gas Company
D. L. Leahy, Southern Counties Gas Company
C. A. Thorp, Los Angeles Gas and Electric Corporation.
C. M. Toynbee, Washington Gas and Electric Company

Insulation

Guy Barker, Chairman, Johns-Manville Company
J. H. Gumz, Pacific Gas and Electric Company
C. A. Thorp, Los Angeles Gas and Electric Corporation

A Sales Wrinkle With Reverse English

MY interest in the Sales Wrinkle department now being conducted by *Western Gas,* leads me to offer the following story which for obvious reasons will not be presented by either of the salesmen concerned.

A gentleman of my acquaintance planned to purchase a mechanical refrigerator as a Christmas present to his wife. In preparation for the purchase he read a great deal of advertising and finally narrowed his selection to a well known electric machine and to the gas Electrolux. The Electrolux came to his attention because of the splendid advertising being run by the manufacturer in the Saturday Evening Post, and also through the radio talks sponsored by the Pacific Coast Gas Association.

A few days before Christmas he took his wife into his confidence and they set out to buy a refrigerator. Inasmuch as the Electrolux was but little known in his city, the electric machine had a distinct advantage, so they called at that salesroom first. A purchase would surely have resulted, but the salesman made three mistakes. He insisted in starting at point No. 1, of his canned sales talk and proceeding logically through it point by point, without giving my friend an opportunity to explain that he knew food should be kept below 50 degrees, he knew about frozen desserts, he knew what ice cubes can be used for, that in fact he knew he wanted a mechanical refrigerator and had not a single lurking desire to use ice or a cooler a day longer than he could help. My friend could not get a word in edgewise until point 99 was reached, at which point the salesman became breathless.

Here the salesman made his second mistake. Upon learning that his refrigerator was considered by his prospect to be the king pin of the electrics, but that there still was a stray thought being given to Electrolux, he stopped talking about his machine and started knocking Electrolux. This, combined with the third delinquency, that of having an odor of liquor on his breath, lost him an easy sale. My friend and his wife walked out on him.

Now these people did not know where they could buy an Electrolux as there had been no local advertising or sales effort. Their natural thought was to go to the office of the gas company, an especially bright idea in this case, as the gas company is also an electric company and they felt sure of getting the real low-down on all types of mechanical refrigerators. Thither they went and proceeded immediately to the show room. There were two refrigerators on the floor, both electrics and both dusty outside and scummy inside. There was one attendant for whom they had to wait a considerable time. Presently he was free.

MY FRIEND: "I would like to know which of these refrigerators you recommend."

THE SALESMAN: "Refrigerators? I am sorry but I belong to the gas department and can't advise you in regard to electric refrigeration."

MY FRIEND: "Well that's all right. I have been looking for someone to tell me about the Electrolux Gas Refrigerator. Can I buy one here?"

THE SALESMAN: "Electrolux? Gas Refrigerator? Are you sure you have that right? I never have heard of such a refrigerator."

My friend is a persistent cuss, and while he did not get a refrigerator for Christmas, he has one now. It is being installed the day this is written. Yes, it is an Electrolux, but I am wondering—wondering if it will be installed correctly, and wondering if he will ever be able to get service, if service is needed.

I hope so, for I do not want to lose his friendship.

Conditions Named for Stunts Night

DEDICATING their histrionic efforts to the theme "Modernize with Gas," companies in Association territory will again develop their individual contributions to Stunts Night, which will be held the evening of September 11 during convention sessions at the Huntington Hotel, Pasadena.

D. L. Scott, director of Stunts Night contests, has issued full particulars on this year's contest conditions direct to individual gas companies. Companies are urged to inaugurate elimination contests within their own organization, both for the purpose of deriving the maximum benefit for themselves, and producing the most representative entry for competition on Stunts Night. The stunt may be produced either by a cast on the stage, or as a motion picture.

Addison B. Day, president and general manager of the Los Angeles Gas and Electric Corporation, will again present a Stunts Night trophy to the winning cast.

Information relative to Stunts Night may be had direct from D. L. Scott, manager of public relations, Los Angeles Gas and Electric Corporation.

Western Metal Congress to be Repeated in 1931

W. H. EISENMAN of Cleveland, Ohio, Secretary of the American Society for Steel Treating, was in San Francisco during January making preliminary arrangements for the second Western Metal Congress and Western States Metal and Machinery Exhibition. The first Congress and Exhibition took place in Los Angeles last January and preliminary advice is that the second will be held in San Francisco Civic Auditorium during the week of February 16, 1931.

Arrangements will be in charge of the Golden Gate Chapter of the American Society for Steel Treating and a number of engineering societies have been invited to participate in developing the technical program. Among these are The Pacific Coast Gas Association, The Pacific Coast Electrical Association, The Society of Automotive Engineers, The American Society of Mechanical Engineers, The American Welding Society, The American Petroleum Institute, and The American Institute of Mining and Metallurgical Engineers.

Professor H. S. Taylor of Stanford University has accepted the chairmanship of the Program Committee. The Pacific Coast Gas Association will be represented by Ray Trowbridge, chairman of its Industrial Sales Committee.

Why Gas Is Better — 3rd Prize Essay

By D. E. FARMER

*Portland Gas & Coke Company**

IN an age of rapid progress, marked by an endless succession of startling inventions and achievements, one commodity stands out with an enviable record of dependable and increasingly valuable service—gas, the perfect fuel.

No other factor has contributed so largely to the emancipation of the housewife from the confining drudgery of household duties. The modern gas range provides instant, easily regulated heat applied directly to the cooking utensils with no diffusion to bring discomfort to the user. The oven, thermostatically controlled through a complete range of desired temperatures, insures the success of every baking venture with a minimum expenditure of effort and time. The beauty of design, and the proven cleanliness, make the range a fitting part of any well equipped kitchen, and the economy of operation and freedom from maintenance expense, are sources of constant satisfaction.

D. E. Farmer

The marvellous discovery that produces cold with heat has given the boon of the gas refrigerator. It preserves the healthful freshness of foods and liquids in a uniformly cold, moisture-free temperature that halts bacterial growth. The total absence of moving parts insures long, trouble-free life, and noiseless operation.

Clean, hot water, that recognized essential for cleanliness and health, is always on tap when a gas-fired water heating system is in use. There are no long waits for replenishment of supply, following the heavy demands of the laundry or bath. In the laundry, the gas-heated washer keeps the water at a temperature that lends to rapid, thorough cleaning; the gas-heated dryer quickly dries the clothes in a dust-free atmosphere, regardless of inclement weather conditions; the gas-heated ironer completes a perfect laundering cycle with a minimum of time and effort.

In the house-heating field, gas has no equal. The installation of a gas-fired heating plant banishes forever the work and worry attendant to the use of other fuels. The sensitive and vigilant thermostat maintains an even, healthful temperature at all times, and supplants the shivering, early-morning trip to the basement. Gone is the toil of building, stoking and tending furnace fires, and the burdensome disposal of the ashes. With gas, an adequate supply of fuel is always available, and there is never any worry of a possible shortage during rigorous winter months. There is no need for large storage facilities, as in the case of solid fuels, or costly tank storage installations, as where liquid fuel is used. This storage space is released and can be utilized for a work shop, a billiard room, a play-room for the children, or for other uses that fill a long felt need. When gas is used, there is none of the soot and grime common to other fuels, to be tracked into expensive rugs, and deposited on the delicate fabrics of curtains and draperies. It is estimated that over 75 per cent of residential fires are chargeable to chimney blazes and defective flues. With gas, there are no inflammable deposits in the chimney, and this dreaded and destructive menace is non-existent. The gas radiant space heater provides an inexpensive and highly satisfactory source of supplemental or auxiliary heat, and its glowing, cheerful warmth is instantly available in the cool spring and fall evenings.

In the industrial field, gas possesses several marked features which raise it far above competitive fuels. The low first cost of equipment and installation, the minimum of maintenance expense, and the low operation costs, are items which contribute to the ever-widening popularity of gas as fuel wherever heat is required. The ease and flexibility of heat control and the certainty of uninterrupted service are vital factors which commend it to many processes, such as the ceramic, and the various metal-treating industries, embody. The very considerable items of fuel storage and handling are eliminated. In the bakery, restaurant, and hotel fields, the cleanliness, ease of control, low cost of operation, and the freedom from the necessity for storage space, place gas far to the front.

In the past the smoking chimney was accepted as being synonymous with industrial prosperity. The measure of a city's manufacturing importance was fixed by the density and extent of the sooty pall which overhung it. Now it is generally recognized that such a condition represents an extravagant waste of fuel energy. In addition, the destructive compounds found in the soot and ash deposited on buildings and other structures, are charged with cleaning, mainte-

*Third prize essay in 1929 contest conducted by Public Relations Section of Pacific Coast Gas Association.

nance, and replacement bills that have assumed astounding proportions. These injurious deposits extend to surrounding farming districts, and form a serious blight on vegetation. Further than this, it has been found that in these industrial centers the smoke blanket shuts off a very large percentage of the health-giving rays of the sun, and in so doing materially impairs the health of residents. It has been definitely established that in such districts the ratio of pulmonary diseases shows a decided increase over that in smoke-free areas. The time is near when legislation will require the complete combustion of fuel before the spent gases are released into the atmosphere. Gas will be the logical and economic solution of this problem, for its products of combustion carry no soot or ash.

From a fuel conservation standpoint, the universal use of gas where heat is required, is pre-eminently desirable. In its manufacture, all of the valuable by-products are separated and recovered, and the full potential value of the basic fuel is utilized.

And finally, the hundreds of utility companies supplying gas to their respective communities are a permanent and integral part of the domestic and industrial life of the nation. As the nation grows, so will these companies grow, and the all-embracing service that they render will become more and more essential to continued progress and expansion. To the loyal members of the gas fraternity, the past is a gratifying memory, the present a glorious field for earnest endeavor, and the future a shining incentive for refreshed and concerted effort.

OSCAR L. MOORE ELECTED TO L. A. G. & E. DIRECTORATE

Oscar L. Moore

Oscar L. Moore, manager customers department, Los Angeles Gas and Electric Corporation, was elected a director of the corporation at the regular January meeting of the board. His election fills the vacancy caused by the death of the late Champ S. Vance.

Mr. Moore has been with the L. A. G. and E. over 25 years, beginning in September, 1904, as a clerk in the gas department. He later served in the bookkeeping and accounting department and in October, 1917, became auditor. He was advanced to his present position in March, 1925.

TWO NEW DISTRICT OFFICES FOR LOS ANGELES UTILITY

In the early part of March the Los Angeles Gas and Electric Corporation expects to begin construction on a new district office building in Huntington Park, Calif., on property purchased by the corporation last year. It is anticipated that approximately $150,000 will be expended in erecting the new building.

When the Huntington Park office is complete, towards the end of the year, the corporation expects to build a district office at Inglewood, California.

Both the Huntington Park and Inglewood districts are being newly created as divisions in the company's service organization, and will handle all distribution and commercial activities within the territory included. At the present time local branch offices are maintained in each of these two cities.

EXECUTIVES INSPECT LINE FROM KETTLEMAN TO ELK HILLS

Southern California Gas Company, with headquarters in Los Angeles, recently brought to completion its 69½-mile 20-inch pipe line from Kettleman Hills field to Elk Hills Junction. The new line will be placed in operation early in February.

On January 21, a party made up of representatives of several Southern California gas and equipment companies left Los Angeles for the purpose of inspecting modern construction methods employed in the building of this new line. The group consisted of Wm. Moeller, Jr., manager of natural gas production and distribution for the Southern California Gas Company; H. P. George, general superintendent of the Southern California Gas Company; Harry L. Masser, vice-president and executive engineer of the Los Angeles Gas and Electric Corporation; Wm. M. Henderson, superintendent of distribution for the same company; M. R. Thompson, vice-president in charge of construction for the Southern Counties Gas Company; A. F. Bridge, vice-president in charge of operation for the same company; Norman R. McKee, purchasing agent for Southern Counties; W. D. Dickey, manager of the Pacific Meter Works, and Herbert G. Day, manager of the Los Angeles office for the same company.

LOUISIANA GAS AND FUEL IS NEW COMPANY

Louisiana Gas and Fuel Company is the name of a new wholesale gas distributing company which has been organized through the merger of 12 Southern gas companies. N. C. McGowen, vice-president and general manager of the Louisiana Gas Company, has been named president of the new company; R. H. Hargrove, of the Palmer Corporation, vice-president; J. B. Lebow, treasurer; B. M. Mowry, general superintendent, and F. E. Lacaye, superintendent of distribution.

The following companies are included in the merger: Excelsior Pipe Line Company, Industrial Gas Company, Louisiana Gas Company, Moorehouse Natural Gas Company, Natural Gas Production Company of Louisiana, Northern Louisiana Natural Gas Company, Ouachita Natural Gas Company, Inc., Palmer Corporation of Louisiana, Panola Oil & Gas Company, Southern Gas Company, Inc., Southern Gas & Fuel Company, U. S. Carbon Company.

A.G.A. DISTRIBUTION CONFERENCE APRIL 9-10-11

The annual distribution conference held under the auspices of the Distribution Committee, Technical Section, American Gas Association, is to be held this year on April 9-10-11 at the Statler Hotel in St. Louis, Missouri. The location was selected especially for the convenience of gas men in the Middle West and Southwest, particularly the natural gas men, and the program will contain much of importance and interest to natural gas men.

ANNUAL OLD GUARD BANQUET OF LOS ANGELES GAS AND ELECT.

The Annual Old Guard Banquet of the Los Angeles Gas and Electric Corporation will be held on February 5, at the Biltmore Hotel in Los Angeles. The Old Guard is welcoming 61 new members at this meeting, and with the addition of these initiates, the membership will total 412. The organization is made up of employees who have served 10 years or more with the company. Addison B. Day, president and general manager of the corporation, will act as toastmaster for the 1930 banquet.

McCullough *is* Auditor *for* Merged Companies

AN announcement has been made by officials of the Standard Oil Company to the effect that Don A. McCullough will be the general auditor for Pacific Public Service and the Standard Management and Operating Corporations, with the subsidiary organizations.

This latter named company has recently been formed by the Standard Oil Company to exercise supervisory powers over the operating subsidiaries of Pacific Public Service, control of which they purchased in October. Standard Management and Operating will take over the activities of these companies formerly taken care of by the United States Engineering Corporation.

Don A. McCullough

Mr. McCullough has been acting as auditor of the Coast Counties Gas and Electric Company, one of the subsidiaries of the Pacific Public Service, and has also been assistant treasurer of Coast Counties. He will retain this latter position, after taking over his new duties.

Mr. McCullough came to Santa Cruz from the Western United Gas and Electric Company of Aurora, Illinois, at the time control of Coast Counties was purchased by the A. E. Fitkin Company in 1928.

R. D. F. Chisholm, assistant auditor of the Coast Counties, will take over Mr. McCullough's duties as auditor. Mr. Chisholm was formerly with the San Joaquin Light and Power Company.

43 OKLAHOMA TOWNS GRANT FRANCHISES IN 1929

Natural gas utility companies were granted franchises in 43 cities and towns in Oklahoma during 1929. The majority of the towns were located in the western section of the state, and gas was piped to most of them during the year. Approximately 600 miles of gas transmission lines were constructed, according to information received from the Oklahoma Utilities Association. This total does not include mileage added in distribution systems.

Among towns which secured natural gas distribution service were: Hammon, Perkins, Manitou, Madill, Tishomingo, Alex, Quinlan, Avard, Mountain View, Woodward, Mooreland, Cherokee, Waynoka, Fort Cobb, Carnegie, Coalgate, Forgan, Beaver, Mountain Park, Snyder, Keyes, Muldrow, Hugo, Maysville, Tyrone, Hooker, Baker and Turpin.

SWEET GRASS, MONT., TO HAVE GAS BY EARLY SUMMER

Sweet Grass, Montana, will be supplied with natural gas by late spring or early summer. Consumers Gas Company has the franchise, and will start work on the line as soon as the frost is gone. E. B. Coolidge is president and general manager for the company.

It is the intention of the Consumers Gas Company to pipe gas into Coutts, Milk River and Warner, Alberta, at a later date. Sweet Grass is near the international boundary.

$200,000 RATE DECREASE FOR SO. COUNTIES GAS COMPANY

A recent rate reduction, amounting to about $200,000, volunteered recently by the Southern Counties Gas Company, went into effect on the utility's southern California system early in January. Santa Monica, Santa Barbara, Ojai and Camarillo consumers will benefit principally by the decrease. A rate form similar to that in effect in Los Angeles and vicinity has been applied in Santa Monica, California, consisting of a modified two-part rate of $1 service charge for the first 300 cubic feet, with a commodity charge of 77 cents per 1,000 cubic feet. This is applied in the company's western district, which includes Santa Monica and adjacent territory.

The commodity rate in Santa Barbara is reduced from 85 cents to 81 cents per 1,000 cubic feet.

FORT COLLINS GETS NATURAL GAS FROM AMARILLO LINE

The last length of pipe in the natural gas line from Amarillo, Texas, to Fort Collins, Colorado, was laid late in December, and service was expected to be complete as soon as the clearing up along the line was finished.

The line linking the Texas fields with Fort Collins joins the Amarillo line at Littleton, Colorado, whence it is laid south through Arvada. From Littleton to Boulder the line is of 10-inch pipe, and from Boulder to Fort Collins, it is of 8-inch pipe.

PLEASANT HILL, MISSOURI GETS NATURAL GAS SUPPLY

Natural gas was turned into the city mains of Pleasant Hill, Missouri, late in December. The gas supply is being obtained from gas wells recently drilled three and one-half miles northeast of the city. The North American Gas & Electric Company which owns the city gas franchise constructed the line which varies between 6½ and 3½ inches in diameter.

AVERAGE DAILY CONSUMPTION GAINS 25 PER CENT IN MONTANA

Natural Gas development in Montana during 1929 has attracted public interest with a daily average consumption of 25,000,000 cubic feet, or an increase of about 25 per cent over 1928. In 1925, the daily average was 7,000,000 cubic feet. Most of the large producing companies are using only 3 or 4 per cent of the flow from each well.

ELECTROLUX COMPANY NAMES MORE WESTERN DISTRIBUTORS

Electrolux Refrigerator Sales, Inc., of Evansville, Indiana, announces the appointment of the Northwest Cities Gas Company as distributor of the gas-fired Electrolux refrigerator at Walla Walla, Washington; and of the Thompson Hardware Company at Borger, Texas.

EAGLE PASS, TEX., GRANTS GAS FRANCHISE TO DEL RIO CO.

Press reports state that Eagle Pass, Texas, has granted a gas franchise to a Del Rio, Texas, company headed by Dr. F. M. Rose and E. F. Measles. Plans are under way, according to report, to construct a gas line from the Mirando field at Laredo to serve several towns in the vicinity of Eagle Pass.

DALLAS GAS CO. OPENS BRANCH OFFICE AT OAK CLIFF

The Dallas Gas Company with headquarters at Dallas, Texas, has opened a branch office in the Oak Cliff Bank and Trust Company of Oak Cliff, Texas, in order to give better service to customers in that district.

May 5-8 Dates *for* New Orleans Natural Gas Convention

E. J. STEPHANY, secretary of the Natural Gas Department of the American Gas Association, has announced May 5, 6, 7 and 8 as the dates for the 1930 Convention of the Department. The announcement was made from the headquarters of the Department, recently removed from Pittsburgh and established in the Allen Building at Dallas, Texas.

E. J. Stephany

Plans for the convention are in an advanced stage, said Mr. Stephany, with all committees assuming an activity which forecasts much for the success of the 1930 meeting. No exhibits will be held at the New Orleans meeting, it has been definitely made known.

On January 13 a meeting of the Program Committee for the Convention was held at Dallas at which plans were discussed for the presentation of a program of outstanding merit and interest.

This meeting was attended by H. C. Morris, chairman of the department and president of the Dallas Gas Company; F. L. Chase, vice-president of the Lone Star Gas Company; A. C. Howard, vice-president of the Dixie Gas & Fuel Company of Houston; A. E. Merchant, superintendent of the Gas Department of the New Orleans Public Service, Inc.; H. L. Montgomery, general manager of the Cities Service Gas Company, Bartlesville, Oklahoma; and E. J. Stephany, secretary of the Natural Gas Department.

Meeting with the committee by special invitation were W. C. Grant, in charge of the Public Relations Department of the Lone Star Gas Company; R. M. Redding, superintendent of the Dallas Gas Company, and R. G. Soper, secretary and vice-president of the same company.

Program committeemen who were unable to attend the Dallas meeting were N. C. McGowen, president of the Louisiana Gas & Fuel Company of Shreveport, who is chairman of the committee; W. A. Dunkley, superintendent of the Gas Department of the Memphis Power & Light Company; George Wehrle, superintendent of the Gas Department, Public Service Company of Colorado, at Denver; L. Fitzpatrick, vice-president of the Utah Gas & Coke Company, Salt Lake City; and T. J. Strickler, vice-president of the Kansas City Gas Company.

The committee voted unanimously in favor of including the question discussion on the 1930 program, which hereafter will probably go under the name of the Open Forum. It is planned to devote an entire afternoon to this question discussion.

It was tentatively decided by the committee to adjourn the afternoon sessions at a slightly earlier hour, having them begin at 1:30 and close at 4 p.m. The morning sessions will begin at 9:30, extending to the noon hour.

Monday, the first day of the convention, will be given over to the entertainment of the visiting gas men, culminating probably with an evening affair to be announced later.

Arrangements and entertainment for the convention are under the charge of a committeee of which A. B. Paterson, vice-president of the New Orleans Public Service, Inc., is chairman. Mr. Paterson and his committeemen are planning several entertainment features of an unusual nature, according to Mr. Stephany, which will help to make the New Orleans convention one to be remembered. Mrs. A. B. Paterson is chairman of the Ladies' Entertainment Committee.

Definite arrangements are now being made with New Orleans hotels and with the railroads for accommodations. Letters will be sent out shortly from the Department headquarters to all members of the Department with regard to these arrangements.

UTAH GAS AND COKE COMPANY NATURAL GAS PUBLICITY

The advertising department of the Utah Gas and Coke Company with headquarters in Salt Lake City, has recently published a portfolio of advertising used by the Utah Gas and Coke Company in 1929, featuring introduction of natural gas.

A section of a recent issue of the Deseret News published in Salt Lake City, was also devoted to the interest of natural gas, giving a history of the new development, and of the difficulties encountered in line construction, as well as a review of the benefits being derived from the "smokeless" fuel by customers along the new route.

NEW BROCHURE ON METTLER GAS BURNERS OFF PRESS

Lee B. Mettler Company announces a new brochure entitled "Mettler Gas Burners," and including a description of the company's new line of gas burning equipment. Installation specifications and blueprints are also given. Copies may be had by addressing the company, 406 South Main Street, Los Angeles, California.

"FAMILY CIRCLE" IS NEW IN L. A. G. AND E. ORGANIZATION

The first "Family Circle" meeting of the Los Angeles Gas and Electric Corporation of Los Angeles, California, was held on Friday, January 17, at the company's auditorium. Every Friday night will be "family" night, and meetings will be held to which the families of all employees will be welcome. At the initial meeting an "Our Gang" comedy was shown, with novelty skits and orchestral music. W. M. Fisher acted as master of ceremonies, which, in this organization, is called Paterfamilias.

SO. CAL. GAS CO. ASKS TO SERVE CORCORAN

Southern California Gas Company, with headquarters at Los Angeles, has applied to the California Railroad Commission for a permit to construct a plant or system for the distribution of gas in Corcoran, in Kings County, California.

With *the* Metermen

S. C. M. A. Gas Measurement Extension Course *Is* Now Open *for* Enrollment

By R. F. ANGELL

President, Southern California Meter Association

MEETING to complete plans for launching an extension course in gas measurement, the Educational Committee of the Southern California Meter Association decided late in January to immediately open enrollment for the course. Distribution of lessons to those sending in their applications will start March 1.

L. L. Sutherland will direct the course for the Association, with the assistance of the Educational Committee, which is comprised of 15 Association members under the chairmanship of L. P. W. Des Brisay.

Twenty lessons will make up the course, each one accompanied by references and practical problems. The list of lesson topics is as follows:

Lesson No.	*Topic*
I.	Properties of Fluids. Units of Measurement.
II.	Properties of Fluids, continued; Pressures, etc.
III.	Laws of Perfect Gases.
IV.	Vapor Pressure.
V.	Measurement by Displacement.
VI.	Velocity of Gases.
VII.	Measurement by Orifice Meter.
VIII.	Principles of the Orifice Meter.
IX.	Calculation of the Coefficient.
X.	Chart Reading.
XI.	Derivation of the Orifice Meter Coefficient.
XII.	Pressure Extensions.
XIII.	The Use of Multipliers.
XIV.	Making up Multipliers.
XV.	Kinds of Charts.
XVI.	Atmospheric Pressure and Gas Measurement.
XVII.	Types of Orifice Meters.
XVIII.	Installation of Orifice Meters.
XIX.	Measurement of the Specific Gravity of Natural Gas.
XX.	Analysis of Natural Gas.

At the January meeting of the Educational Committee it was decided to offer the course for a total cost of $18 to non-members of the Association, and $17 to members. A payment plan has been arranged for the convenience of students, $8 to be paid with the enrollment, and the balance in two equal monthly installments.

The course will be designed to cover the fundamentals of gas measurement, first laying a groundwork for the meterman who is unfamiliar with basic principles. Practical field problems will be constantly borne in mind in conducting the work.

The director, Mr. Sutherland, has for the past two years conducted classes in gas measurement for southern California meter men and others interested. The Association feels that making this material available to those outside of its immediate territory will be a worthwhile contribution to the cause of measurement and will spread the benefits of this needed instruction.

An announcement on this page of *Western Gas* last month that plans were under way for such a course brought responses from a considerable number of men interested in further information. Most of the western states were represented in the replies.

The Association wishes it understood that there is no restriction upon entry to the course. It is open to anyone interested in improving his knowledge of the fundamentals of gas measurement, no matter where he may be located. Lessons will be mailed directly to the student by Mr. Sutherland, and personal attention will be accorded every one who enrolls.

Enrollment is now definitely open for the extension course. Applications, with the initial payment of $8, may now be sent to this address:

Southern California Meter Association, 810 South Flower Street, Box 1100, Station C, Los Angeles, Calif. Attention of L. L. Sutherland, Educational Director.

Sampling Bomb Design; Methods *of* Collecting Gravity Samples

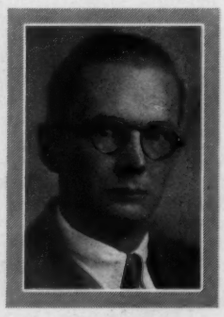
By EDGAR VALBY

*Richfield Oil Company**

THIS paper is a contribution from the Standards Committee, and was prepared to lead the discussion regarding the design of bombs and sampling for the guidance of the committee in preparing a data sheet covering these subjects

SAMPLING BOMB

Some characteristics that the sampling bomb should have are as follows: It should be light to carry, yet strong enough to withstand moderate pressures, and of sufficient capacity to hold enough gas for the laboratory when filled at atmospheric pressure. Many different types of bombs are in use. We realize that each bomb must have some advantage, or it would not be in use. Some are large in diameter, some small, some with conical ends and some with bumped ends, some made of sheet iron and others made of standard pipe; all used for gathering gravity samples.



Edgar Valby

Regarding material, No. 14 galvanized iron, 3/16-inch black iron, or lightweight casing, when properly welded, are heavy enough to stand pressures up to 40 pounds, yet are easy to carry to the gas line to be sampled. Some companies have their bombs made of 6-inch standard pipe for use on high pressure lines, but this is not necessary if proper care is taken in sampling.

For volume required in the laboratory the minimum capacity should be about ¼ cu. ft. This volume is sufficient even when filled at low pressures. The various bombs in use apparently fulfill this volume requirement.

The sketches are of bombs used by various companies and are self-explanatory.

All of these bombs are made by welding the material together. In general ¼-inch by 1½-inch nipples are used for fitting the valve to the bomb. Many different valves are in use. A ¼-inch needle valve, to guard against a leaky valve, having a large seat opening, such as the Lunkenheimer No. 906, Powell No. 860, or the Metric Steel, is suitable to use. The ordinary needle valve has too small an opening for rapid purging of

* Presented before the Southern California Meter Association, December 19, 1929.

the bomb. The small seat of these valves can be enlarged to speed up the purging of the bomb.

Many varieties of handles are in use, some made of ¼-inch rod, and others of 1-inch strap iron with a 2-inch by 5-inch opening.

The bombs are tested at 100-150 pounds water pressure for leaks.

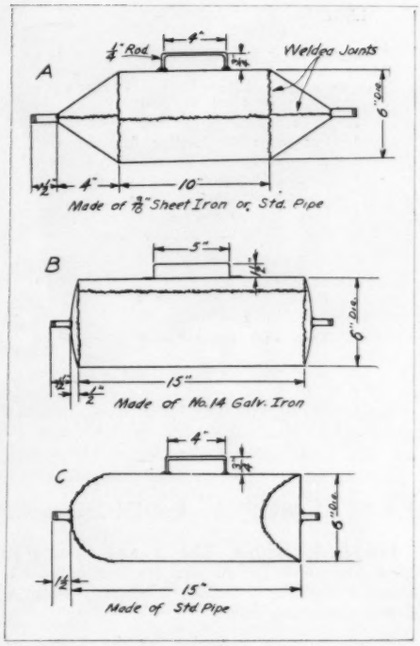
Some companies have numbers stamped on the bomb, and others tag their bombs for identification.

SAMPLING AND PURGING OF BOMB

In general, there are two methods for sampling a gas line, depending upon its pressure. If the pressure is above atmospheric, the method is obvious, but if a vacuum line is to be sampled, it is necessary to use a vacuum pump to take gas out of the line. As a rule the well gravity sample is taken at the same time as a charcoal test is made, so that pump and lines are well purged. Care should be taken that there are no air leaks in the suction line. A gas analysis for oxygen indicates if there is a leak. If the vacuum is not too high, it is possible to take a sample by water displacement.

In regard to purging, the bomb with conical ends is probably better than the others when they are connected to a gas line and allowed to blow for five or more minutes. However, there is no advantage if presure is built up and then blown off. In this respect if the pressure is built up to 15 pounds and blown down to atmospheric pressure, less than 1 per cent of the old gas is left in the bomb, after seven purgings. A pressure of 30 pounds will require four or five purgings to replace the old gas. On gas lines carrying 40 pounds or less, full line pressure can be put on the bomb, but on high pressure lines the operator can judge the bomb pressure by holding his thumb over the valve opening. When it is possible to hold the pressure, there is enough gas for the laboratory.

As a general precaution, care should be taken that no condensate or oil is allowed to enter the bomb. Some companies steam out the bombs, but the writer does not know how general it is for gravity samples. The steaming of bombs is customary for fractionation samples.



Sampling bombs of various types being used by companies operating in southern California

S.C.M.A. NOW HAS OFFICIAL MAILING ADDRESS

Through the courtesy of the Los Angeles Gas and Electric Corporation the Southern California Meter Association has been given the privilege of using the corporation's headquarters building in Los Angeles for its official mailing address. Henceforth the mailing address of the S.C.M.A. will be 810 South Flower Street, Box 1100, Station C, Los Angeles, California. Association properties will be stored at this address.

Meter Association's Third Annual Hi-Jinks Draws Record Turnout

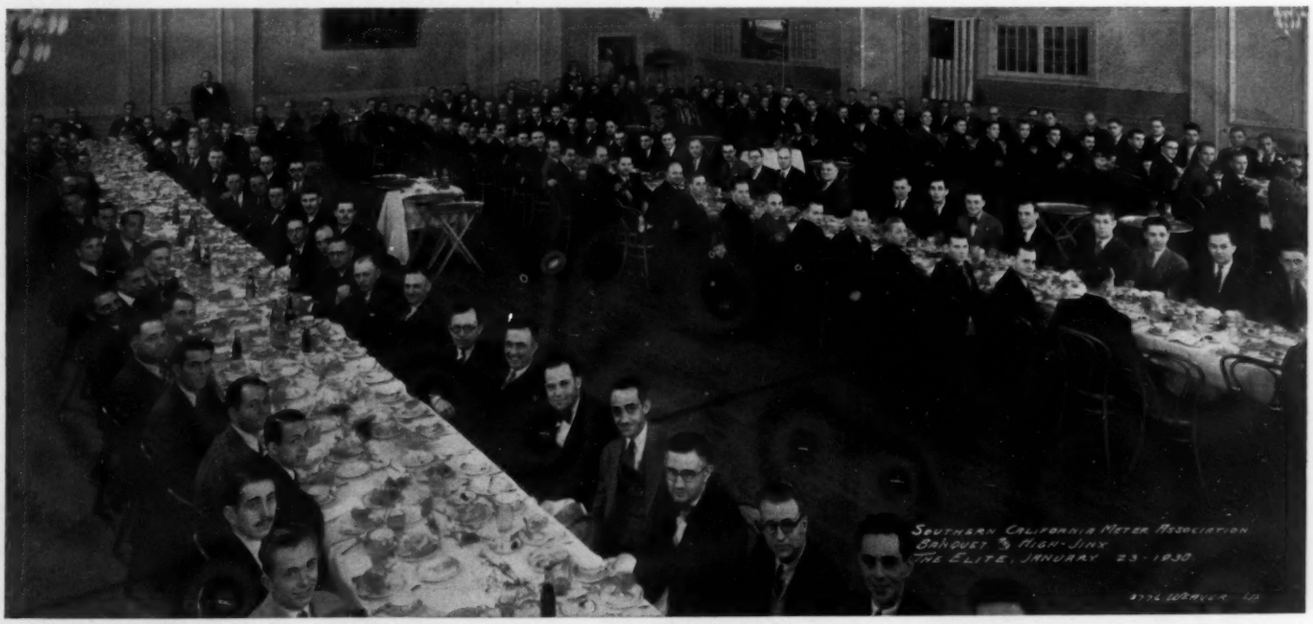
WELL over 200 members and friends of the Southern California Meter Association celebrated that organization's Third Annual Hi-Jinks on the evening of Thursday, January 23. The Hi-Jinks was staged this year at the Elite Cafe in Los Angeles. Registration for the dinner totaled 222.

Entertainment of general excellence and variety, featuring song and dance artists of Southern California was the order of the evening, following the banquet.

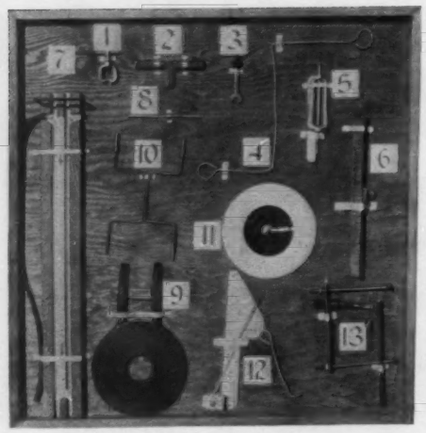
Credit for the efficient handling of Hi-Jinks arrangements goes to a committee of three, Malcolm Miller, chairman of the association's entertainment committee, assisted by Carl Brockman and Kenneth Miller.

Associate members of the association who shared in meeting Hi-Jinks expense included the following:

Fluor Corporation, Ltd., Pittsburgh Equitable Meter Company, Neilan Schumacher Company, Pacific Pipe & Supply Company, Robinson Orifice Fitting Company, Westcott & Greis, Inc., and the Commercial Iron Works.



Flashlight photograph of the banquet group which met at the Southern California Meter Association third annual Hi-Jinks, held January 23 in Los Angeles



LEGEND TO "GADGET" ENTRIES SHOWN AT LEFT

Display panel on which Southern California Meter Association "Gadget Contest" entries were mounted. Gadgets are shown by number, and are identified as follows:

1. Clock hub puller.
2. Instrument for leveling float.
3. Wrench for removing stuffing box screw.
4. Wire for removing obstructions inside of tubes adjacent to orifice flanges.
5. Shaft alignment gage.
6. Auxiliary scale for water manometer.
7. U-type manometer.
8. Device for starting screws in close places.
9. Self-contained orifice plate.
10. Rapid clock winders.
11. Time dial for checking accuracy of clocks.
12. Instrument for holding pen arms rigid while soldering.
13. Center bearing puller.

Prize Announcement *in* First "Gadget" Contest

SOME months ago the Southern California Meter Association organized a "Gadget Club," for the purpose of encouraging the development of new devices and methods, and bringing to light present unusual metering "wrinkles" now in use. Three prizes were offered for the first gadget competition. This contest has now come to a close and the gadget committee, of which Carl Brockman of the Union Oil Company is chairman, announces the following winners:

E. Lorenz, Southern California Gas Company, first prize—$10 in cash, given by the Southern California Meter Association—for a "Bearing Shaft Alignment Gage," designed and made by E. F. Ruppert, and submitted by Mr. Lorenz.

Gordon Buchanan, Union Oil Company of California, Los Angeles Refinery, second prize—A copy of the "Natural Gas Handbook" by Diehl, contributed by Westcott & Greis, Inc.—for a clock hub puller.

Joseph R. Milton, The Texas Company, third prize—A Lefax size leather notebook, donated by the Foxboro Company—for a meter protecting box.

Prizes will be awarded at the February 27 meeting of the Association. Descriptions of the winning gadgets, accompanied by illustrations of each device, appear in this issue of *Western Gas.*

HONORABLE MENTION

Three gadgets were selected for Honorable Mention, as follows:

George H. Briggs, Los Angeles Gas and Electric Corporation, Seal Beach plant—auxiliary scale for water manometers.

M. E. Carrico, Southern California Gas Company—center bearing puller.

E. Lorenz (for gadget submitted by E. F. Ruppert of Southern California Gas Company)—instrument for leveling float.

1st Prize "Gadget"—*A* Shaft Alignment Gage

Submitted by

E. LORENZ

Southern California Gas Company

THIS bearing shaft alignment gage, illustrated above, holds the shaft of the gage in such a manner that it may be rotated and the shaft lined up with a straight edge.

E. F. Ruppert of the Southern California Gas Company designed and made this instrument, which is proving extremely useful for its purpose.

In the drawing above adequate specifications will be found for making up the instrument.

2nd Prize Goes *to* This Clock Hub Puller

Submitted by

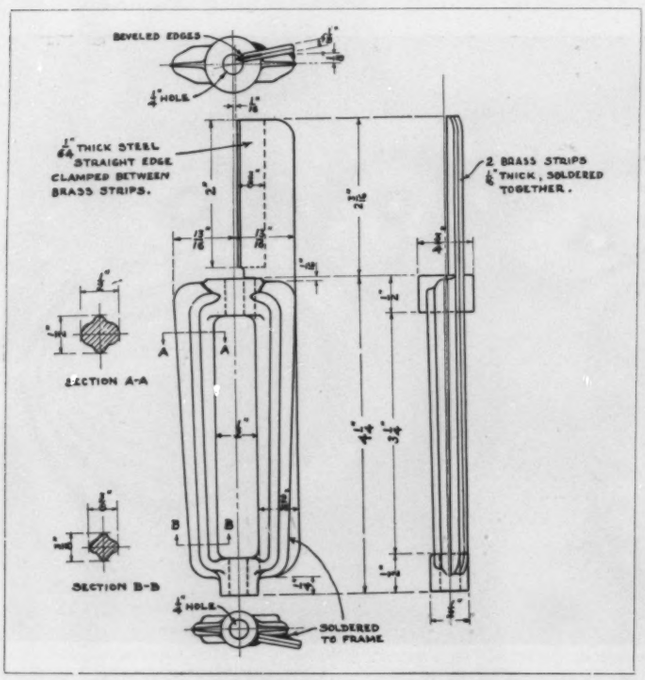
GORDON BUCHANAN

Union Oil Company of California, Los Angeles Refinery

IN changing or working on meter clocks one has considerable trouble in taking off the chart-hubs which frequently become corroded to the clock shaft. Many clocks are broken and hubs ruined by twisting and pulling the hubs off with pliers.

In the Union Oil Company meter shops at the Los Angeles refinery, chart-hub pullers of the type illustrated above have been in use for some time. The hub-pullers have proven a very convenient addition to the meterman's kit, preventing damage to clocks and hubs. The puller is slipped over the chart-hub and the jack screw is screwed down on the end of the clock shaft, pulling off the hub.

The body of the puller is forged from mild steel and finished with a file. The screw is of the same material and has a 3/16-24 machine screw thread.



Bearing shaft alignment gage detail.

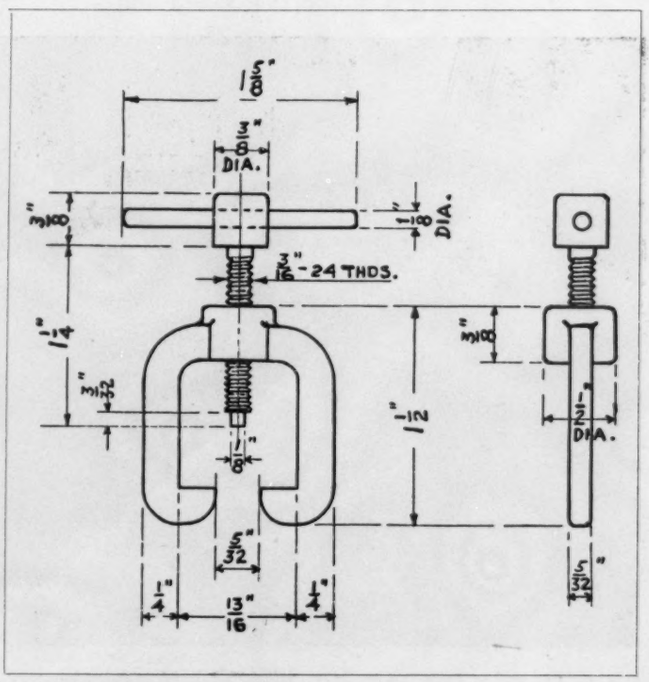
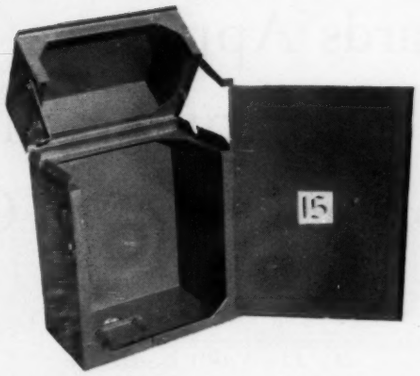


Diagram for clock hub puller.

3rd Prize Award—*A* Meter Protecting Box

Submitted by
JOSEPH R. MILTON
Texas Company

THIS orifice meter box has been designed for our field meter installations and we think it has many advantages over other boxes that are in general use. It can be installed in two or three minutes, and can be removed from the meter in even less time, without molesting the gage lines or meter in any way. It is very light and easy to handle, but still rugged enough to stand the rough use it necessarily receives in the field, where most of our field meters are measuring wet gas, and must be cleaned and calibrated very often.



The box is made of No. 22 gage galvanized sheet iron and the total weight is 24 pounds. It is made in two sections. The lower section is 22 inches long and the upper section 7 inches long. The sections are fastened together on the back of the box with two hinges. On each side there is a hasp that holds the box together. Holes are cut for gage lines on each side where the two sections meet so that when the lid is swung back the box will slide down the standpipe and make all of the meter, including the by-pass and gage lines, accessible. A slot is cut in the bottom of the box to fit the standpipe and a small strip is bolted in front of the stand-pipe to hold the box in place. All of the open edges are reinforced, and light braces are bolted across the front of the box. All bolts used on the box are ½x3/16-inch stove bolts and can be installed or removed without the use of wrenches, if necessary.

This box has been in use for over a year on our field meters in southern California, and we have found it to be a very economical piece of equipment, satisfactory in every way.

Pittsburgh Equitable *in* New Los Angeles Offices

PITTSBURGH EQUITABLE METER COMPANY, with headquarters in Pittsburgh, Pennsylvania, has opened new branch offices at Los Angeles, where the company handles a complete stock of gas meters and regulators, as well as water, oil and gasoline meters, with complete repair parts for these products. When entirely complete, the plant will be equipped with air compressors, a heat-controlled proving room, and the latest in repair tool equipment for meters and regulators.

W. H. Davis

W. H. Davis, for 15 years district sales representative for the company in the mid-continent area, has been placed in charge of the Los Angeles branch, establishing his residence in that city in December.

The service department and meter shop at the new Los Angeles headquarters will be under the supervision of Albert Schawalder, who was especially schooled and trained for this work at the Pittsburgh factory.

FEBRUARY 27 MEETING TO CONVENE IN LOS ANGELES

February 27 is the date for the next meeting of the Southern California Meter Association, to be held at the Los Angeles Gas and Electric Corporation building, 810 South Flower Street, Los Angeles. After a dinner in the banquet room the association will adjourn to the L. A. G. & E. auditorium on the same floor of the building, for its business session. The banquet will convene at 6:45.

WESTCOTT & GREIS, INC., MOVES LOS ANGELES OFFICE

Westcott & Greis, Inc., announces the removal on January 20 of the company's offices from 1945 Santa Fe Avenue, Los Angeles, to 2013 Santa Fe Avenue.

BARTON COMPRESSOR PLANT IS MODERN INSTALLATION

ON December 31, the Arkansas-Louisiana Pipe Line Company put its Barton compressor station into service, according to W. E. Nestor, superintendent of compressor stations for the organization. The station is located one and a half miles north of Eldorado, Arkansas.

A feature of the station exterior is the use of brick work for a distance of about three feet on the side walls, adding an attractive note to the building's appearance.

The equipment in the main engine room consists of three 500 h.p. single tandem double acting Cooper gas engines, direct connected to 13½-inch by 36-inch double acting Cooper gas compressors. An extra foundation is provided for installation of another unit when future necessity requires.

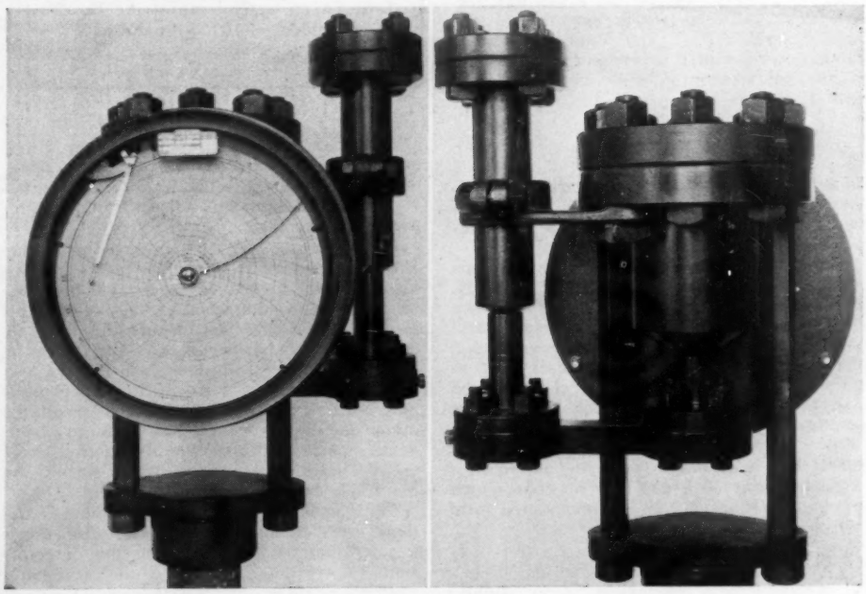
The auxiliary equipment consists of one 185 h.p. three-cylinder vertical Cooper gas engine, direct connected to a 125 k.w. generator, with direct connected exciter; switchboard containing power, lighting and ignition panels and instrument board; three 500 G.P.M. motor driven centrifugal water pumps and two 30 cubic foot motor-driven air compressors, battery cupboards and charging apparatus. The auxiliary engine-generator unit is to be used only as a stand-by unit and for power to operate water pump.

New High Pressure Flow Meter *by* Foxboro

THE Foxboro Company has developed a new flow meter to operate at a working pressure of 0 to 5,000 pounds per square inch. It has been built for measuring the flow of gas, air, steam, hot oil and gasoline.

The pressure chambers of this new meter have been constructed to meet the demands of use under high pressures. All working parts subjected to pressure are drop forgings.

The meter is calibrated to read and record in terms of flow and may be equipped with an integrator that reads direct without multipliers the total flow in gallons or feet or pounds.



LEFT: Foxboro high pressure flow meter, front view. RIGHT: rear view

Bureau *of* Standards Apparatus *and* Method *for* Determining Gas Compressibility *and the* "Super-Compressibility" Correction

By HOWARD S. BEAN

*Physicist, U. S. Bureau of Standards**

(FOR REFERENCES SEE PAGE 52)

THOSE who read R. N. Donaldson's paper on the subject of compressibility of natural gas, appearing in *Western Gas* for January, 1930, will have gained an excellent background for Mr. Bean's present discussion. Mr. Donaldson's excellent report dealt briefly with experimental procedure for determining compressibility correction factors, using both the bottle method and the U. S. Bureau of Standards' recently developed method. He presented only highlights of the Bureau's method and construction of the apparatus involved, which are here treated in considerable detail. The Bureau of Standards' apparatus, its operation, and the computation of the "super-compressibility factor" from data secured, are covered by Mr. Bean.

It is hardly necessary to comment upon the importance of this research into natural gas compressibility, which gains value in direct ratio to the growing use of high pressure transmission.

The paper which *Western Gas* here presents through the courtesy of Mr. Bean, will appear in slightly modified form in an early issue of the Bureau of Standards Journal of Research.—*Editor.*

Introduction

IN THE development of the gas industry, and particularly the natural gas industry, the question of measurement is ever present. The continual demand for smaller and smaller limits of uncertainty has made it necessary that every detail involved in gas measurement be given careful attention and study. Gas companies, gas meter manufacturers, and technical institutions and associations have spent large amounts in time and money in the study of these details, and there still remains much to be learned.

H. S. Bean

One of the troublesome details in gas measurement arises from the fact that the volume occupied by a given mass of gas depends upon the temperature and pressure. These variations of the gas volume with the temperature and pressure would introduce no serious difficulty if our natural and industrial gases followed the ideal gas equation

$$P\,V = R\,T \qquad (1)$$

in which P and T are, respectively, the absolute pressure and absolute temperature; V is the volume of a unit mass of gas, or the reciprocal of the density; and R is the so-called *gas constant* for the given gas, the numerical value of which depends on the units by which P, T and V are measured. From this relation it is evident that if T is maintained constant V must vary inversely with P, that is

$$\frac{V_1}{V_2} = \frac{P_2}{P_1} \qquad (2)$$

a very simple relation. Equation (2) is merely a statement of Boyle's law from which the common conception of the compressibility of a gas is obtained.

But in reality, no gas follows the relations expressed by equations (1) and (2) exactly. Different gases depart from Boyle's law by different amounts, and both the amount and the direction of the departure depend upon the temperature. With most gases, and in particular, the industrial or fuel gases, the direction of departure is such that as the pressure is *increased* from P_1 to P_2 at constant temperature, the volume *decreases* more than it should to satisfy equation (2). This behavior of a gas may be represented by writing equation (2) in the modified form

$$\frac{V_1}{V_2} = y\,\frac{P_2}{P_1} \qquad (3)$$

in which y is a numerical factor slightly greater than 1.[1]

This excess of compressibility over what is indicated by Boyle's law may be called the "super-compressibility," and the quantity y will be designated as the "super-compressibility factor."

For air at 60° F., the value of y at the absolute pressure P = 600 lbs. per sq. in. is about 1.014. Hence at so high a pressure as this, the computation of the volume by means of Boyle's law would involve an error of only 1.4 per cent. And since in the orifice meter equations, which need not be discussed here,[2] pressure appears only under the square-root radical, the resulting error in the rate of flow deduced from orifice meter readings would be only about 0.7 per cent—an amount which would be negligible in many cases.

With most natural gases, however, the departures from Boyle's law are much greater than with air, and the use of equation (2) without including the correction factor y may result in serious errors, if the gas is metered at high pressure. For example, in the case of a natural gas for which experimental data will be given later (Table 1), the value of the super-compressibility factor, at 32° F. and 210 lbs. per sq. in. absolute pressure, was found to be nearly 1.04. If this gas were measured under these conditions through an orifice meter, the correct volume at atmospheric pressure deduced therefrom would be nearly 2 per cent greater than would be found by the use of Boyle's law. At 600 lbs. per sq. in. the error might be nearly three times as great.

So long as the pressures at which gases were metered were relatively low, say 75 lbs. per sq. in. absolute or less, the effects of super-compressibility were of little or no commercial importance. But the increasing tendency to raise the pressures on transmission lines has necessarily led to the use of meters at higher pressures, and instances have been reported of measurements at pressures between 700 and 1000 lbs. per sq. in. This rise in working pressures, coupled with the increasing demand for more accurate metering, has made super-compressibility a subject of considerable commercial importance.

For several years the Bureau of Standards has been cooperating in researches on orifice meters conducted by the Committee on Gas Measurement of the Natural Gas Department of the American Gas Association. When it was decided to conduct some tests at pipe line pressures of 200 lbs. and higher, it became necessary to prepare apparatus with which to determine the super-compressibility factors which would be needed in making the calculation involved in analyzing the data from the meter tests. A description of the apparatus which was made for this purpose, the method of operating it, and a method of computing the super-compressibility factor from the data obtained is herein presented.

At this point it is appropriate to mention that the essential features of both the apparatus and the method of computation were suggested by Dr. Edgar Buckingham. Acknowledgement is also given to Mr. J. R. Fay for assistance in the preparation of the apparatus.

DESCRIPTION OF THE APPARATUS

Before going into details it may be stated that the principle of the method is, roughly, as follows: After a sample of the gas has been collected at high pressure in a steel cylinder of known capacity, successive small portions of the sample are withdrawn into a glass burette where their volumes can be determined at atmospheric pressure. This is continued until the whole sample has been reduced to atmospheric pressure, and the sum of all the volumes at atmospheric pressure is then compared with the volume to which the initial known volume of gas

* Publication approved by Director of the Bureau of Standards of the U. S. Department of Commerce.

would have expanded if it had been reduced to atmospheric pressure in accordance with Boyle's law.

The principal parts of the apparatus and the method of connecting them are shown schematically in Fig. 1, while Figs. 2-a and 2-d show the apparatus in detail. The list of parts indicates very birefly the purpose or function of each of the separate parts, but it is advisable to discuss some of them more fully and to point out certain desirable qualities they should possess.

The cylinder A (Fig. 1) need not be very large—the capacity of the one used was about 36 cubic inches. It should be strong enough to withstand any pressure at which a test is to be started, without expanding appreciably. While not essential, it is convenient to have the cylinder provided with two valves to facilitate purging and filling. The capacity of the cylinder, with valve 7 (Fig. 2-a) closed, to the outlet connection of

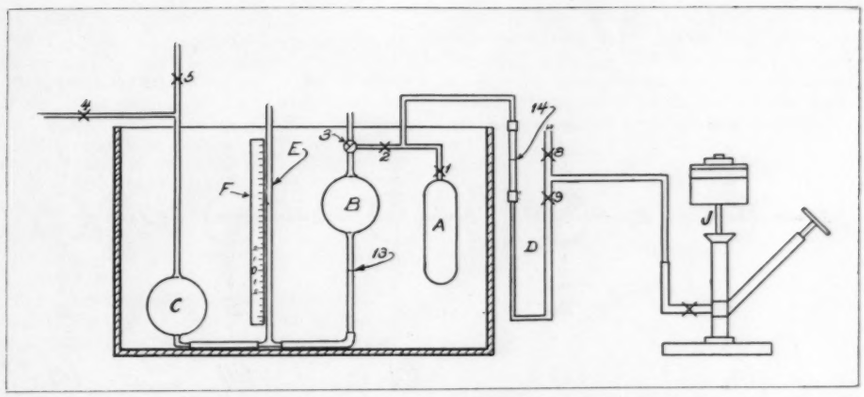


Fig. 1. Outline of the essential features of the apparatus used to determine the super-compressibility factor of a gas

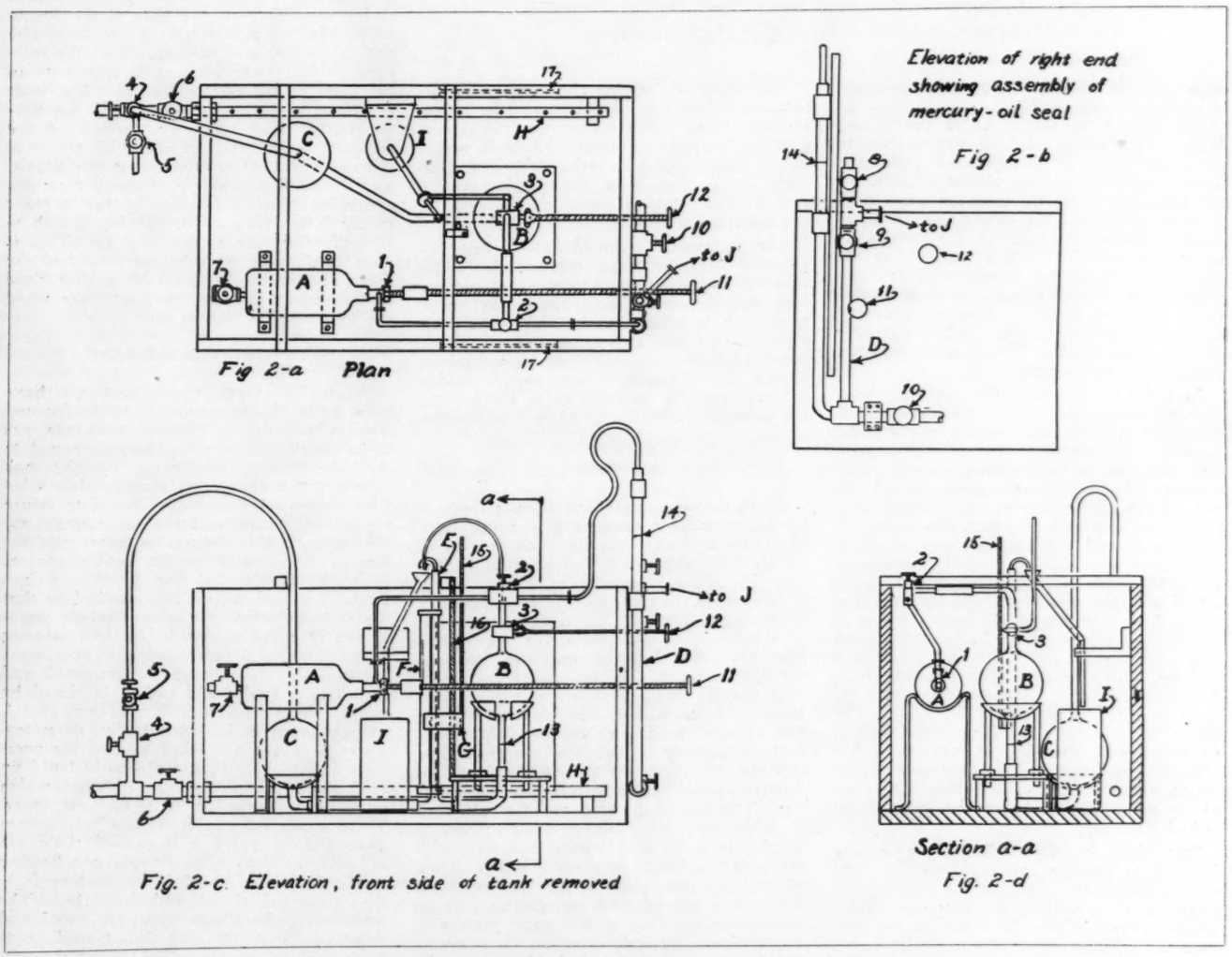


Fig 2-a Plan
Elevation of right end showing assembly of mercury-oil seal
Fig 2-b
Fig. 2-c Elevation, front side of tank removed
Section a-a
Fig. 2-d

Fig. 2. Apparatus used to determine the super-compressibility factor of a gas

A. Gas cylinder for holding gas sample.
B. Measuring burette or chamber.
C. Mercury reservoir.
D. Mercury—oil (or oil) seal.
E. Manometer tube.
F. Manometer scale.
G. Manometer reading slide.
H. Agitator tube.
I. Trap for spilled mercury.
J. Piston gage.
1. Needle valve, gas cylinder outlet.
2. Needle valve, for admitting gas to B.
3. Three-way glass cock.
4. ⅛-inch needle valve for admitting pressure to C.
5. ⅛-inch needle valve atmospheric relief for C.
6. Valve for regulating gas (or air) flow to H.
7. Needle valve for filling A, ⅛-inch.
8. Need'e valve for releasing air bubbles from D.
9. Needle valve for protecting J.
10. Needle valve (all steel) used in filling D with mercury.
11. Extension for operating valve 1.
12. Extension for operating cock 3.
13. Etched line about lower neck of B.
14. Etched line about middle of glass tube portion of D.
15. Extension rod for moving G.
16. Guide rod on which G slides.
17. Windows in box sides.

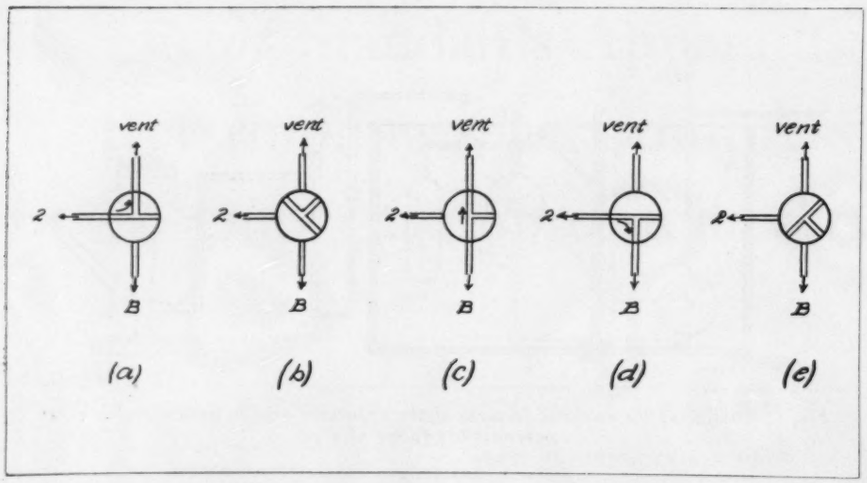


Fig. 3. Successive positions of the core of the three-way cock, 3

valve 1 must be determined to an accuracy of about one part in 2000.

The burette, B, should be of strong and fairly heavy glass. In the upper stem is the 3-way cock, 3, by means of which the burette may be opened to the atmosphere for purging, or to the tube for connecting it with A. About the lower neck, a short distance below the body of the burette, is an etched line (13). The capacity of the burette, between the 3-way cock as the upper limit and the etched line as the lower limit, must be determined to an accuracy of one in 2000 or better. (The passages in the plug of the 3-way cock are not included in this volume.)

In order to determine the pressures with a satisfactory degree of accuracy, it is necessary to use a dead-weight piston gage, J, (Fig. 1). This, of course, will require that there be at hand the necessary small weights for reading pressures to 0.1 lb. per sq. in. The use of the piston gage makes it necessary to have the trap D between it and the gas cylinder A. This trap is essentially a special manometer about 15 inches high, most of it being built up of suitable small pipe fittings, but the upper 5 or 6 inches of the leg to which A is attached consists of a heavy gage glass tube, thoroughly annealed, and with each end set into a special pipe coupling with Khotinsky cement. Around the center of the glass tube is an etched line (14). The upper end of the other leg of the trap is provided with two valves, one on either side of the tee to which J is connected. The length of this leg is such that the offset of the tee is slightly below the level of the etched line, 14.

Small bore ⅛-inch O. D.) copper tubing is used to connect the trap with A, and enough bends are made in the trap end to guard against putting an excessive strain on the glass. There is a tee in the tube near the cylinder end, and the needle valve, 2, is connected to one arm of this tee. The outlet of this valve is connected to the burette, B, by as short a tube as possible. The capacity of the tubing between valves 1 and 2, and the etched line 14 must be determined to the same absolute accuracy as the other volumes.

The manometer tube, E, is the elongated offset of a tee. The run of the tee forms a part of the line which joins the lower neck of B with the reservoir, C. It is desirable to have the tube E long enough to extend even with or above the top of the atmospheric outlet from the 3-way cock, 3.

The scale, F, which is attached to or fastened beside the tube E, should be about 10 inches long with the zero near the center and the graduations numbered both ways. In the apparatus now being described, this scale is of glass with etched graduations and figures, and the smallest division of the scale is 1/20 inch.

The reservoir, C, should have a capacity about 1/10 larger than that of B. The relative elevations of B and C should be such that the etched line, 13, on the lower neck of B is level with or higher than the opening into the upper neck of C. This upper neck of C is connected to the valves 4 and 5. Through 4, gas or air under pressure may be admitted to C for forcing the mercury over into B, while 5 is a relief valve.

ADJUSTMENTS

After the apparatus has been assembled it is necessary to make a few adjustments before it is ready for use. The first is to adjust the quantity of sealing fluid in the trap D. This is very easy if only oil is to be used in the trap, as it is only necessary to pump in oil from the piston gage until it stands about ½-inch above the etched line 14. Air bubbles may be released through valve 8. When mercury is used with the oil, this adjustment is not so easy. Mercury is introduced into the trap through the all-steel needle valve, 10 (Fig. 2-a). Enough mercury is used to fill the gage glass side to ½-in. above the etched line, 14, and to extend about 3-inches up the other leg. The rest of the trap and the tube to J is filled with oil. The procedure used to do this is to fill both legs of the trap with mercury to a height of about 3 inches. Then after filling the piston gage side with oil valve 9 is closed and enough mercury to complete the filling of the gage glass side is introduced through valve 10. It is necessary to get out all the air bubbles from the oil in the trap and tubing to J.

The use of mercury in one leg of the trap introduces an unbalanced pressure on the piston gage. It would be possible to have this column of mercury just balance the weight of the piston; but in the particular apparatus being described a steel disk had been attached to the plunger as a part of an arrangement to keep the plunger from being blown from the oil cylinder, and to balance this added weight on the plunger would have required an undesirably long trap. In such a case as the present one it is necessary to calibrate the combined mercury-oil-piston gage system, and this is done by applying air or gas under pressure to the mercury side of the trap until the plunger, with all weights removed, begins to rise and the surface of the mercury to fall. When the top of the mercury is in the plane of the etched line, 14, the amount of pressure being applied is read on a mercury manometer temporarily connected ahead of the trap. On account of the effects of friction and viscosity upon the plunger, it is best to have the pressure increasing or decreasing very slowly and to read the auxiliary manometer quickly as the surface of the mercury in the trap creeps past the etched line. The value used is then the average obtained with falling and rising pressures.

The next adjustment to be made is that of the position of the scale, F, beside the manometer tube, E. To do this the cock 3 and the valve 5 are opened so that both B and C as well as E are open to the atmosphere. Mercury is then poured into the system until C is full and the surface of the mercury in the lower neck of B is exactly in the plane of the etched line, 13. The scale is then moved up or down until its zero is exactly level with the surface of the mercury in E, and is finally fastened in that position. After completing this adjustment, enough mercury is removed from the system so that the surface of the mercury in the lower neck of B will be ¼-inch to ⅜-inch below the etched line, 13. This is done so that the mercury may not foul the inner surface of the lower neck of B right at the etched line, by standing there when the apparatus is not in use.

EXPERIMENTAL PROCEDURE

When the foregoing adjustments have been made, the apparatus is ready for use. The cylinder A is charged with the gas to be tested, put in place, and connected to the tube from D and valve 2. The tank in which the apparatus is mounted is filled with water and the water stirred to insure a uniform temperature. To purge the tubing, cock 3 is turned so as to open the line from valve 2 to the atmosphere, as shown by position (a) Fig. 3. With valves 2 and 9 closed, valve 1 is cracked so that the pressure within the tubing becomes equal or nearly equal to that in A. After closing valve 1, valve 2 is opened until the excess pressure in the tubing is dissipated and then closed again, and cock 3 is closed by turning it to position (b) of Figure 3. A second purging is not usually necessary. Valve 1 is again cracked so that the pressure within the tubing will slowly build up to the full pressure within A, after which valve 1 is opened a full turn or more. Weights are now placed upon the piston gage and as valve 9 is opened these are adjusted so that with the plunger floating freely, the top of the fluid in the trap is in the plane of the etched line, 14. The weights on the piston gage are noted and recorded Next, the cock 3 is turned so as to open B to the air while closing the tube to valve 2, [position (c) Figure 3] and, with valve 5 closed, valve 4 is cracked so as to admit air or gas under a low pressure (10 to 20 lbs. per sq. in.) into C, thus forcing mercury from C into B. Just as the mercury in B reaches the edge of the three-way cock, valve 4 is closed and cock 3 is turned so as to connect B to the line from valve 2 [position (d) Figure 3]. As valve 5 is opened slowly, valve 2 is cracked, thus letting gas from A into B as the mercury flows back into C. As the surface of the mercury in B enters the lower neck, valve 2 is nearly closed, and it is closed tight

when the surface of the mercury has fallen just below the etched line, 13. Cock 3 is next turned so as to close all entrances [position (e) Figure 3]. By closing valve 5 and cracking 4, the surface of the mercury is brought back just to the plane of the etched line, 13, and the pressure of the gas in B is then obtained by reading on F the position of the surface of the mercury in E.

This completes one cycle of operations and we proceed with another by readjusting the weights on the piston gage to balance the new pressure in A. B is again filled with mercury and the operation continued, as just described. This cycle of operations is repeated until the gage pressure of the gas in A has been reduced to zero or nearly zero. After the last filling of B with gas, valve 2 is left open so that A and B are in free communication. The surface of the mercury in the trap. D, is brought to the plane of the etched line, 14, by manipulation of the oil pump on the piston gage. The pressure in B is now determined as before and this is also the pressure of the gas finally remaining in A.

This final gage pressure must be low enough to be measured on the short manometer E which, in the present apparatus. had a range of about (plus or minus) 5 inches of mercury, or somewhat less than (plus or minus) 2.5 lb. per sq. in. and to ensure this result it may be necessary to adjust the length of the last few steps in the process. When the gage pressure in A has fallen to about 100 lbs. per sq. in. it is divided by the average fall of pressure during the 3 or 4 immediately preceding cycles. If the quotient is very nearly a whole number, it is evident that this whole number of additional cycles, similar to those immediately preceding, will reduce the gage pressure so nearly to zero that it will be within the range of the manometer E. In this case no change from the previous rate of withdrawal of gas from A is required. Otherwise, the rate of withdrawal for the remaining cycles must be increased or decreased sufficiently that a whole number of cycles will leave the final residual pressure within the range of the manometer E.

Whether such an adjustment may be needed and, if so, where it should be started, depends on the relative volumes of A and B and on the range of E, so that no general numerical directions are possible, but the practical working of the process is illustrated by the figures in the third and fourth columns of Table 1.

METHOD OF COMPUTING THE SUPER-COMPRESSIBILITY FACTOR

In developing the equations needed for the computations, the following notation and definitions will be employed.

(a) Constants of the apparatus.

V_a=the volume of the cylinder A and the adjacent tubing, out to the valve 2 and the etched mark 14.

V_b=the volume of the burette, from the mark 13 to the plug of cock when closed.

Only the ratio of these volumes appears in the final equation so that their values may be expressed in terms of any convenient unit.

K (lbs. per sq. in.)=the trap constant.

It is the gas pressure that must be applied at the top of the trap in order to force the mercury surface down to the mark 14 when the piston of the gage is floating freely with all the weights removed. It is measured, once for all, on an auxiliary mercury column, as described above under the heading "adjustments," and then expressed in lbs. per sq. in.

(b) Observed quantities.

W (lbs. per sq. in.)=the pressure due to the weights on the piston gage.

It is the total added weight in lbs. divided by the cross section of the piston in sq. in. For convenience, each of the movable weights should be marked with its equivalent in terms of pressure, so that the value of W may be read directly.

B (ins. Hg.)=the barometer reading, corrected to 32°F.

p_b (ins. Hg)=the reading of the manometer E.

For the highest possible accuracy, p_b should also be corrected to 32°F, but in most cases that would be a useless refinement.[3]

t(°F.)=the temperature of the water bath.

It is assumed that t remains sensibly constant thoroughly the complete set of measurements on any one sample of gas collected in A. Before starting the observations, time must be allowed for the newly introduced sample to come to the temperature of the bath.

n=the number of cycles of operations in the whole set of measurements on the sample.

(c) Deduced quantities.

B_s (lbs. per sq. in.)—the barometric pressure expressed in pounds per square inch.

The reduction is made by means of the relation

1 (inch Hg. 32°F.)=0.4912 (lb. per sq. in.) (4)

P_a (lb. per sq. in)=the absolute pressure in the cylinder A and the adjoining tubing as far as the valve 2 and the mark 14, when the valve 1 is open:

$$P_a = W + K + B_s \quad (5)$$

P_b (lb. per sq. in.)=the absolute pressure in the burette:

$$P_b = 0.4912\ (B + p_b) \quad (6)$$

V_s=the volume that would be occupied by the mass of gas which fills the cylinder and tubing at the pressure, P_a, if it were allowed to expand to atmospheric pressure, B_s.

y=the super-compressibility factor.

A definition for it is obtained by rewriting equation (3) in the very general form

$$y = \frac{P_1 V_1}{P_2 V_2} \quad (7)$$

in which the subscripts 1 and 2 refer to two sets of conditions so related that P_1 is numerically less than P_2.

By substituting in equation (7) specific values for P and V from the above notation we have

$$y = \frac{B_s V_s}{P_a V_a} \quad (8)$$

in which B_s, P_a and V_a are known and it remains to find the value of V_s.

Let the sbuscript k be used to specify quantities referring to the k-th cycle of operations: k may have any value from 1 to n inclusive.

At the start of the k-th cycle the pressure in the cylinder and tubing is $(P_a)_k$. The gas withdrawn into the burette fills the volume V_b at the absolute pressure $(P_b)_k$; and if its pressure were changed to B_s, its volume would be

$$v_k = B_b \frac{(P_b)_k}{B_s} \quad (9)$$

for P_b is always so nearly equal to the outside barometric pressure B_s that the departure from Boyle's law over this small range of pressure is entirely negligible.

Starting with the k-th cycle and proceeding through the n-th or last, the combined volume, at the pressure B_s, of all the portions of gas withdrawn into the burette is

$$v_k + v_{k+1} + \ldots\ldots + v_n = \frac{V_b}{B_s}\left[(P_b)_k + (P_b)_{k+1} + \ldots\ldots + (P_b)_n\right] = \frac{V_b}{B_s}\sum_n^k P_b \quad (10)$$

At the end of the n-th cycle, the cylinder and tubing remain filled with gas at the final pressure $(P_b)_n$, and if this residual gas were also brought to the pressure B_s, its volume would be

$$v_r = V_a \frac{(P_b)_n}{B_s} \quad (11)$$

All the gas is now accounted for and we have

$$(V_s)_k = v_k + v_{k+1} + \ldots\ldots + v_n + v_r \quad (12)$$

or by (10 and 11)

$$(V_s)_k = \frac{1}{B_s}\left[V_b \sum_n^k P_b + V_a\ (P_b)_n\right] \quad (13)$$

and substituting this value in (8) we have

$$y_k = \frac{1}{(P_a)_k}\left[\frac{V_b}{V_a}\sum_n^k P_b + (P_b)_n\right] \quad (14)$$

as our final equation for computing the value of the super-compressibility factor at the pressure $(P_a)_k$.

As already remarked, the volumes V_a and V_b appear only as a ratio, and it may be noted that the pressures also occur in both numerator and denominator of (14). Hence they might equally well have been expressed in inches of mercury instead of pounds per square inch, the only requirement being that P_a and the P_b's shall be expressed in terms of the same unit.

The trap constant K and the volume ratio (V_b/V_a) having been determined once for all, the computation of y from the observed data by means of equation (14) may conveniently be carried out in the following steps:

1. For each cycle of operations, compute the values of P_a and P_b (equations 4, 5, and 6).

2. Starting with the n-th or last value of P_b, add to it the (n-1)th value of P_b; add to this sum the (n-2)th value and so on, thus finding the successive values of

$$\sum_n^k P_b$$

for all the cycles, from the last to the first.

3. Multiply each of these sums by the volume ratio (V_b/V_a) and to this product add the n-th value of P_b.

4. Divide each of the quantities thus obtained by the corresponding value of P_a: the quotient is the required value of y.

A sample set of observed and computed values is given in Table 1. If the values of y are plotted against those of P_a, and if

Compressibility Test Data

Sample collected at - Daly Station Test No. - II Barometer - 29.42 at 72°
Date of collection - Aug. — 1928 Date of test - Aug. — 1928 - 29.44 at 73°
Pressure when collected - 210# gage Test made by - H. S. B. Room temp. - 69.8° — 73°

Volume ratio V_b/V_a = 0.8672 Barometer corr. to 32° B = 29.31 ins.
Trap constant K = +9.66 lb./sq.in. B_s = 14.40 lb./sq.in.

	Observed Values			Computed Values					
k cycle No.	Bath Temp °F	W lb./sq.in.	P_b In. Hg.	P_b lb./sq.in.	$\sum_n^k P_b$	$\frac{V_b}{V_a}\sum_n^k P_b$	$\frac{V_b}{V_a}\sum_n^k P_b + (P_b)_k$	P_a lb./sq.in.	y
1	32.1	186.2	-0.56	14.12	233.04	202.09	218.26	210.26	1.038
2		174.6	+0.67	14.73	218.92	189.85	206.02	198.66	1.037
3		162.8	-0.32	14.24	204.19	177.07	193.24	186.86	1.034
4		151.2	-0.52	14.14	189.95	164.72	180.89	175.26	1.032
5	32.5	139.8	-0.41	14.20	175.81	152.46	168.63	163.86	1.029
6		128.2	-0.26	14.27	161.61	140.15	156.32	152.26	1.027
7		116.5	-0.30	14.25	147.34	127.77	143.94	140.56	1.024
8		104.7	-0.26	14.27	133.09	115.42	131.59	128.76	1.022
9		93.0	-0.05	14.37	118.82	103.04	119.21	117.06	1.018
10		80.7	-0.32	14.24	104.45	90.58	106.75	104.76	1.019
11	32.6	69.0	-0.22	14.29	90.21	78.23	94.40	93.06	1.014
12		56.9	+0.94	14.86	75.92	65.84	82.01	80.96	1.013
13		44.4	+1.16	14.97	61.06	52.95	69.12	68.46	1.010
14		31.7	+1.10	14.94	46.09	39.97	56.14	55.76	1.007
15		18.9	+1.18	14.98	31.15	27.01	43.18	42.96	1.005
16	32.9	6.1	+3.61	16.17	16.17	14.02	30.19	30.16	1.001

Table 1

a mean curve is drawn through the resulting band of points, it appears that values of y read from the curve will nowhere be in error by more than 0.002, if the volume ratio V_b/V_a, was accurately determined. The value of Vy needed in orifice meter computations will therefore be correct within 1 part of 1000 and we may conclude that experiments of the sort from which the data in Table 1 were obtained are amply precise for ordinary commercial purposes.

SUPPLEMENTARY NOTES

Volume of Tube Between Valve 2 and Cock 3.

It may have been noted that the small volume of the tubing between valve 2 and cock 3 which, for convenience, we will designate by *u*, has been omitted from all calculations. It will now be shown that this omission has introduced no appreciable error. Before the burette is filled with gas the first time, the tubing has been purged and the section *u* remains full of gas at sensibly atmospheric pressure. Whenever the burette is being purged of gas, *u* will always remain full of gas, regardless of whether cock 3 is turned so as to entrap the gas therein or not. (It is better practice to turn 3 so as to close off the tube from valve 2; then even if 2 should leak a little the gas will not escape unmeasured.)

Now the actual quantity or mass of gas entrapped within *u* during each purging of B will depend upon the pressure in B at the time cock 3 is turned to close off *u*. But this pressure will usually be very nearly atmospheric if the experimental work is done with reasonable care. Hence the successive masses of gas within *u* will be sensibly equal, and if they were exactly equal it would be unnecessary to consider them at all. This applies to all fittings of B from 1 to (n-1) inclusive.

After the last or n-th filling of B, all valves between A and B are left open. If at this time it should happen that P_b were just equal to B_s this last mass of gas in *u* would be equal to the mass of gas in *u* just prior to the first filling of B. Obviously, in this case no correction would be needed.

In most cases P_b will be either greater or less than B_s and the last mass of gas in *u* will be correspondingly greater or less than the first. In these cases it is true that, in principle, a correction should be applied, and the amount of this correction could readily be determined. But it is also evident that since this correction would be applied to only the last of the n masses of gas taken from A into B, the correction will have no sensible influence upon the results, if the volume of *u* is small compared to that of B. (In the apparatus shown in figure 2 the ratio of *u* to V_b is less than 1:500.)

Relation Between Volumes of Cylinder and Burette.

If the volumes of the cylinder and burette are made approximately equal, each filling of the burette will reduce the pressure in the cylinder by approximately one atmosphere—a conveniently simple relation. This, however, might require an undesirably large number of steps or cycles, and when the initial cylinder pressure is 300 lbs. or over, it is desirable to have fewer steps than a 1 to 1 ratio of volumes would require. In such cases it would be convenient to have the cylinder and burette volumes in the ratio of 1 to 2 or 1 to 3. Such a relation of volumes would not lessen the accuracy and usefulness of the results, but would greatly shorten the time required to make the test. In a commercial apparatus it might be convenient to have cylinders of two or more sizes, which would permit the use of the size most suitable to the pressure at which the sample was collected.

Precautions to be Observed in the Use of the Constant Temperature Bath.

With the present apparatus as shown in Figure 2, a water bath is used to maintain the gas and all parts of the apparatus, except the trap and piston gage, at a constant temperature. This makes it necessary to be very careful that no water enters any of the tubing or joints while operating the apparatus or when removing and replacing the cylinder. If water should get into the burette or tubing, it must be removed. In the case of water in the burette, it may be possible to remove most of it by removing

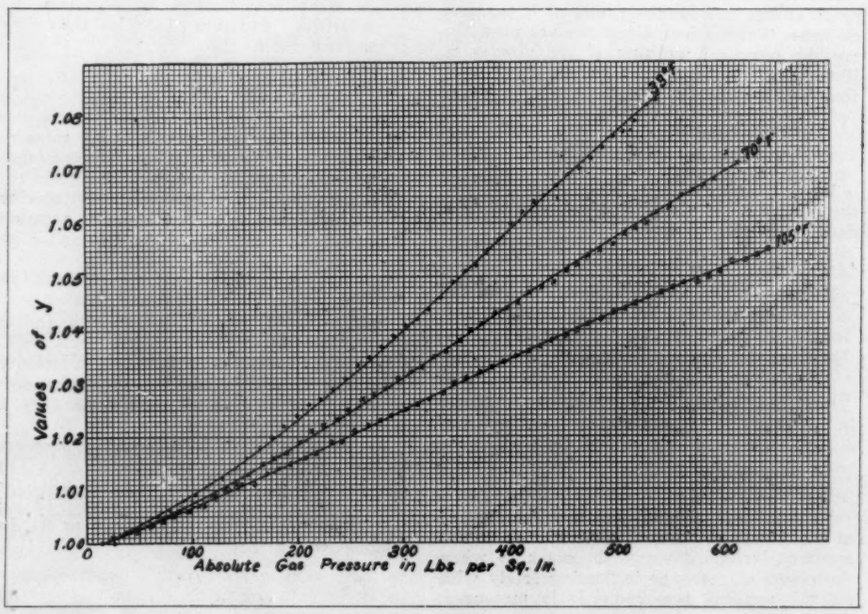


Fig. 4. The effects of temperature upon the super-compressibility correction factor. A large gas cylinder was filled with gas to a pressure of about 1000 lbs. and samples of gas were drawn from this cylinder when filling the sample cylinder, A

the plug of the cock 3 and forcing the water out with the mercury. The final traces of moisture may best be removed by repeatedly filling the burette with warm air that has been passed through a dryer.

One reason for maintaining the temperature constant is that the magnitude of the super-compressibility factor depends upon the temperature of the gas at which the test is made. In general, the lower the temperature the higher will be the value of this factor, as illustrated by Figure 4; but over a limited temperature range, for instance from 50°F to 70°F., the change in the value of this factor will probably be small for most industrial gases. The effects of such small variations in the factor upon the measurements of gas will probably be negligible from the standpoint of commercial metering, particularly in measurements by orifice meters where the value of y occurs in the computations only as the square root.

A more important reason for using a water bath is that computations by means of the equations given above are all based on the assumption that the temperature of the gas remains constant throughout each complete set of observations. If this condition is not satisfied, the equations may be modified to take account of the changes of temperature; but the computations are then more complicated and it is better to keep the temperature as nearly constant as practicable. A variation of the order of 1°F, such as is shown in Table 1. may be disregarded.

Effects of Moisture in Connections

In the preceding section attention is called to the necessity of keeping the burette and tubing dry and free from all water and oil particles. Since failure to do this may lead to very misleading results, it will be well to consider this subject in more detail.

At the start of a test the sample cylinder is filled with gas under a relatively high pressure. It may be saturated with water and oil vapors at that pressure and the bath temperature. As the gas is drawn out by successive filings of the burette, the gas pressure decreases and the gas in both buertte and cylinder becomes relatively drver. If then this gas comes in contact with particles of water some of this water will be picked up in the form of vapor. This acquired vapor will increase the total pressure of the gas in the burette over that which the gas alone would have, with the result that the value of y will be increased.

If the water particles are in the burette or the connections between the burette and valve 2 the absorption of moisture may take place nearly uniformly throughout the test. The probable effect in this case would be to increase the slope of the y-P_a curve more or less uniformly. However, this condition is not the most likely to occur. Firstly, it is seldom necessary to make any changes in the connections of this part of the system once it is put together. Secondly, the most likely place for water to enter would be about the plug of the 3-way cock and even if this should happen the presence of the water would be noticeable.

In the particular apparatus here described the most probable place for water particles to lodge is in the tubing between valves 1 and 2, because the union joint near valve 1 was broken and made each time the cylinder was fil'ed. During a test the gas pressure within this part of the tubing is the same as in the cylinder. If there is any water within this tubing the amount that will be absorbed by a gram of gas will be extremely small at the higher pressures but will increase rapidly as the gas pressure approaches atmospheric. This will cause the increments in y to be excessively large at the pressures close to atmospheric, as illustrated in the curves of Figure 5.[4]

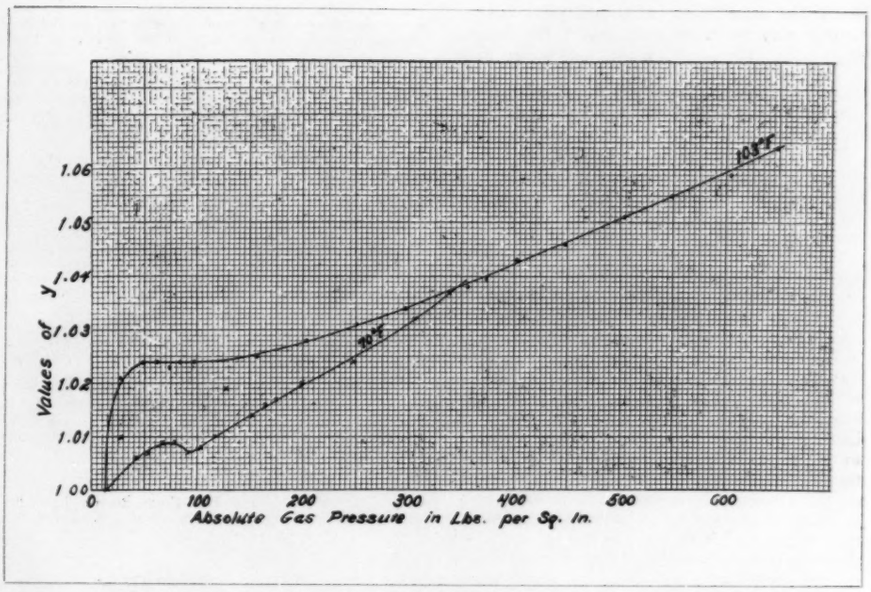


Fig. 5. The effects of water in the connections upon the super-compressibility correction factor. Samples of gas used in these tests were from the same source as those from which the curves in Fig. 4 were obtained

Comparison of This and Other Methods of Determining the Super-Compressibility Factor.

In the method just described the sample of gas which is used represents the actual conditions of pressure and degree of saturation with water and oil vapors that existed in the line at the time the sample was collected. Also, by regulation of the bath water temperature the test can be made at the same temperature as that of the gas in the line. Since this temperature is maintained constant while the pressure is steadily decreased, no condensation of any vapors mixed with the gas will take place. Furthermore, if the test is carefully made, there will be no absorption of additional vapors by the gas, with the result that the y-P_a curve obtained from the test represents the magnitude of the deviation from Boyle's law within the degree of precision mentioned in a preceding section.

In some instances which have been reported, a sample of the gas is collected in a large cylinder at the line pressure. The volume at atmospheric pressure is then obtained by metering the gas through a small laboratory wet gas meter, or by the displacement of water in an inverted bell. This method has been used in a few instances. However, in at least one group of tests made by this method of which a report has been published[5] the curves obtained are similar to those of Figure 5. While this similarity suggests that the sharp rise in the y-P_a curve at low values of P_a was due to the presence of water in some part of the apparatus with which those tests were made, it would be impossible to assign that as the real cause without knowing all of the conditions.

Another method consists of starting with a small sample of the gas at atmospheric pressure and compress it over mercury. The several pressures applied and the corresponding volumes are read by suitable instruments and from the data thus obtained the y-P_a curve can be determined. Under suitable conditions a very high degree of accuracy may be obtained by this method and it is well suited to laboratory works on pure, dry gases. However, this method is not suitable when an industrial gas, and particularly a natural gas, is to be studied, because these gases are always more or less saturated with water and oil vapors, particularly when at atmospheric pressure. As such a gas is compressed a part of these vapors is condensed with the result that the deviation from Boyle's law will be exaggerated, and this exaggeration will be relatively more at the lower pressures. In the report[6] on one group of tests made by this method the curves indicate that some condensation occurred as the gas was compressed, though possibly not enough to be readily observed.

There is also an analytical method which has been tried and possibly used in a few instances. With this method it is assumed that the super-compressibility factor for a gas mixture may be calculated on the basis of a chemical analysis of the mixture if we know the super-compressibility factors for all of the pure constituents.[7] A chemical analysis of a gas sufficiently accurate for this purpose can usually be obtained fairly easily as most companies interested in this question have both the men and the equipment for making such tests. The super-compressibility factors for the pure gases may be obtained from tables in various reference books or may be calculated by one of the several equations of state.[8]

In a few instances in which comparisons have been made it was found that results given by this analytical method usually agreed fairly well with the results obtained by the method described in this paper. However, the use of this method is limited because there is little or no reliable data on several of the common constituents of natural gases.

Additional Notes on the Operation and Construction of the Apparatus.

Since the apparatus as described uses mercury, it is necessary that there be no parts or fittings, particularly in the mercury and gas leads, that the mercury will attack. This rules out brass fittings and soldered

joints for most parts, although pure copper tubing may be used with but little danger of trouble. However, when the water bath is used, it is desirable to avoid the use of iron and steel parts unless they can be adequately protected against the action of water and air.

For connecting the mercury reservoir with the manometer and burette, it is advisable to use a rubber tubing that will not foul the mercury. Such tubing is obtainable under the name of "nitrometer tubing."

Whenever changing the pressures to which the tubing and trap are subjected, care must be exercised to do it slowly, so as not to subject the glass portion of the trap to sudden pressure changes.

The object of the glass portion of the trap is to enable one to see that the surface of the trap fluid is always at the same height whenever the pressure is determined. Exact readings or settings are not required, as a variation of 1/20-inch either way from the line would have only a very slight effect on the results. It is therefore possible that in place of glass a tougher translucent material might be used (for example, so-called clear Bakelite tubing). This would greatly reduce the chance of breakage and trouble with the trap.

REFERENCES

[1] This statement is true when restricted to most natural gases at the temperatures and pressures ordinarily encountered in commercial work. From a general standpoint there are many exceptions to it, one being that for most all gases the direction of the departure from Boyle's law will be the reverse of that stated and the value of v will be less than 1, at sufficiently high temperatures or under very high pressures. Another exception is that for some gases, notably hydrogen and helium at ordinary temperature, the value of y is less than 1.

[2] See Sections X, XI and XXVI of Bureau of Standards Research Paper No. 49, Discharge Coefficients of Square-Edged Orifices for Measuring the Flow of Air.

[3] If one has at hand a chart showing the relation of inches of mercury and lb. per sq in. for different temperatures of the mercury it will not be essential to correct B and p_b to 32°F.

[4] After the particular tests were completed from which the curves in Fig. 5 were obtained, small drops of water were found in the tubing near valve 1.

[5] Corrections to Boyle's Law for High-Pressure Gas, by D. E. Silcox, Mechanical Engineering, November, 1925, page 897.

[6] Deviation of Natural Gas From Boyle's Law, by R. F. Earhart and S. S. Wyer, Trans. A. S. M. E. Vol. 38 (1916) p. 285.

[7] The Compressibility of Natural Gas at High Pressures, by G. A. Burrell and I. W. Robertson, Bureau of Mines Technical Paper No. 131.

[8] Relations Between the Temperature Pressure and Density of Gases, Circular of the Bureau of Standards No. 279.

Plan 7th Annual Meter School

THE dates selected by the General Committee of the Southwestern Gas Measurement Short Course, for its seventh annual meter school held at the University of Oklahoma at Norman, are April 15, 16 and 17. These dates were announced following a meeting of the General Committee of the school held at Norman on January 14.

The school is conducted under the auspices of the College of Engineering of the University of Oklahoma assisted by the Oklahoma Corporation Commission and the Oklahoma Utilities Association. Four hundred and fifty measurement men took the course last year, and plans are under way to accommodate even a larger group than this at the 1930 school.

D. A. Sillers, superintendent of the Measurement Department of the Lone Star Gas Company, Dallas, is chairman of the General Committee. Members serving on the committee are: C. B. Day, chief engineer of the Consolidated Gas Utilities Company, Oklahoma City; Earl Rush, superintendent of the Measurement Department of the Empire Companies, Bartlesville; F. C. Walters, superintendent of the Measurement Department of the Oklahoma Natural Gas Corporation, Tulsa; W. H. Carson, professor of the College of Engineering, University of Oklahoma, Norman; E. F. McKay, manager, Oklahoma Utilities Association, Oklahoma City; E. A. Clark, superintendent of distribution of the Oklahoma Natural Gas Corporation, Tulsa; F. D. Frank, manager, Industrial Sales, Empire Companies, Bartlesville; C. W. Robbins, superintendent of distribution, Little Rock Gas & Fuel Company; R. H. Lussky, gas engineer, Oklahoma Corporation Commission; A. J. Kerr, midcontinent manager, Pittsburgh Equitable Meter Company of Tulsa; R. D. Turner, Skelly Oil Company, Tulsa, Okla.; Eugene Metz, American Meter Company, Kansas City, Mo.; B. P. Stockwell, Oklahoma Utilities Company, Bristow, Okla.; D. C. Williams, Kay County Gas Company, Ponca City, Okla.; G. P. Dunn, Phillips Petroleum Company, Bartlesville, Okla.; S. J. Fraser, Prairie Oil & Gas Company, Independence, Kan.

From this group the following were elected as chairmen of sub-committees: C. B. Day, chairman of the Program Committee; Earl Rush, chairman of Exhibits Committee; F. C. Walters, chairman of the Publications Committee; W. H. Carson, chairman of the Banquet and Entertainment Committee; E. F. McKay, chairman of the Publicity, Registration and Housing Committee; C. W. Robbins, chairman of the Approved Methods Committee.

Announcement is made that greatly enlarged facilities will be provided by the University for the 1930 school, with ample space for class-room and laboratory work. Equipment companies will be given both laboratory and class rooms for instruction regarding the use of their products.

One of the important items in connection with the meeting of the general committee, in addition to formulating general plans for the school, was the adoption of resolutions stating the facts on organization and purposes of the meter school.

It was suggested by W. H. Crutcher to the Oklahoma Utilities Association and sponsored by this Association, the Oklahoma Corporation Commission, and the College of Engineering of the University of Oklahoma. The first meter school was held at the University in 1924. During succeeding years the enrollment has grown from 60 at the first school to 450 at the sixth school.

It is the aim and purpose of the Gas Measurement School to provide, through the cooperation of the University, the various Associations, and the Gas and Gasoline Companies, a means whereby the men in the industry may get together to study problems pertaining to the measurement and regulation of dry and casinghead gas.

The general committee is composed of approximately 15 active members. They are appointed yearly by the chairman of the Gas Division of the Oklahoma Utilities Association. The College of Engineering of the University of Oklahoma, the Oklahoma Utilities Association, the Oklahoma Corporation Commission, and several equipment companies are represented on the committee. The remaining members are drawn from representative gas and gasoline companies, personal qualifications of the individual as an active and valuable member of the committee being considered before the size of his company.

Any person interested in the measurement and regulation of gas may attend the course by payment of the registration fee. Invitations are sent to all equipment companies handling equipment for the measurement and regulation of gas.

Instructors are appointed by the chairman of the Program Committee from among any persons available, first consideration being given to the competence of the instructor.

SOUTHERN COUNTIES IMPROVES DISTRICT OFFICES

Southern Counties Gas Company, with headquarters in Los Angeles, California, announces several improvements in its district offices.

A new addition to the Santa Monica office is nearing completion, and will cost approximately $25,000. According to J. C. Gilbert, district manager, more display space will be afforded by the improvements which are being incorporated in the building.

The Whittier office of the Southern Counties Gas Company is undergoing complete remodeling, according to district manager W. G. Rich. The interior of the building is being torn out to make room for a large display floor, a model kitchen, and a larger customer's floor An auditorium, with a seating capacity of 130 and a fully equipped working kitchen installed on the platform, will be one of the important features of the new office.

The company has also just completed constructing a warehouse at Whittier, costing $25,000. Appliances sold by the company will be tested and stored there for delivery in the Whittier district. Work orders, meter testing and other installation work will be handled at the warehouse.

A.G.A. MONTHLY CHANGES FORMAT IN JANUARY

With the January, 1930, issue of the American Gas Association Monthly, the format of the publication was changed from 6¾ inches by 10 inches to 8½ inches by 11¼ inches.

O. L. HALEY NOW CHIEF SCOUT FOR ARKANSAS NATURAL

Arkansas Natural Gas Corporation announces the appointment of O. L. Haley as chief scout for the company. Mr. Haley was formerly stationed at El Dorado, Arkansas.

Natural Gas Odorization *in* Southern California

(Continued from Page 26)

About 90 per cent of the leaks found as a result of the odorant are on the consumers' side of the meter, and many of those found are so small that it is very difficult to locate them. Large numbers of very small leaks (1/10-1/16 cu. ft. per hour) at the cocks on stove manifolds, etc., are disclosed by the odorant. This latter fact leads us to believe that we can reduce the quantity of odorant used materially and still keep the explosion hazard to a minimum. Many instances could be cited of hazardous conditions brought to light as a result of the use of odorized gas. The following examples are quoted from an inspector's report:

"Leak Order No. 3700. Estimated leakage 200 cu. ft. per hr.; ¾-inch service leading to prepay meter. Service was leaking under the northeast corner of house with an opening 5 inches long and from ¼-inch to ½-inch wide. This was a very hazardous condition and possibly would not have been discovered for some time if the odor had not been so noticeable, as the prevailing winds are from the west and any gas odor would have been dispatched over adjoining vacant property."

"Leak Order No. 3724. Estimated leakage 100 cu. ft. per hour. Leak was reported by No. 33 Sunset. No leaks were found at No. 33 but odor was traced to No. 29 Sunset, where service was found to be badly corroded and rusted with an opening about 2½ inches long and ½ inch wide rusted through pipe under front house. Two dwellings are located on this property and service traverses beneath both. This leak was in a very hazardous location."

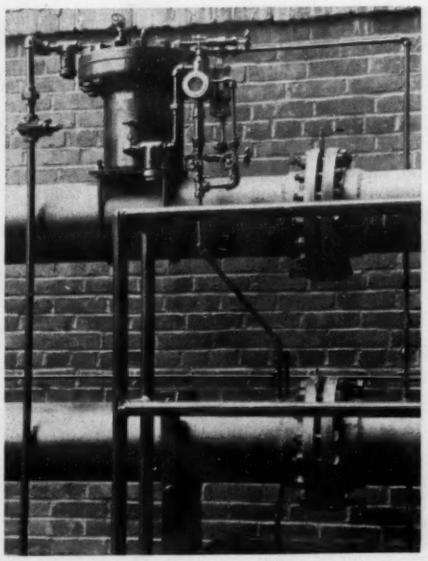


Fig. 6. Gas odorizer located at the Hollywood holder station of the Los Angeles Gas and Electric Corporation.

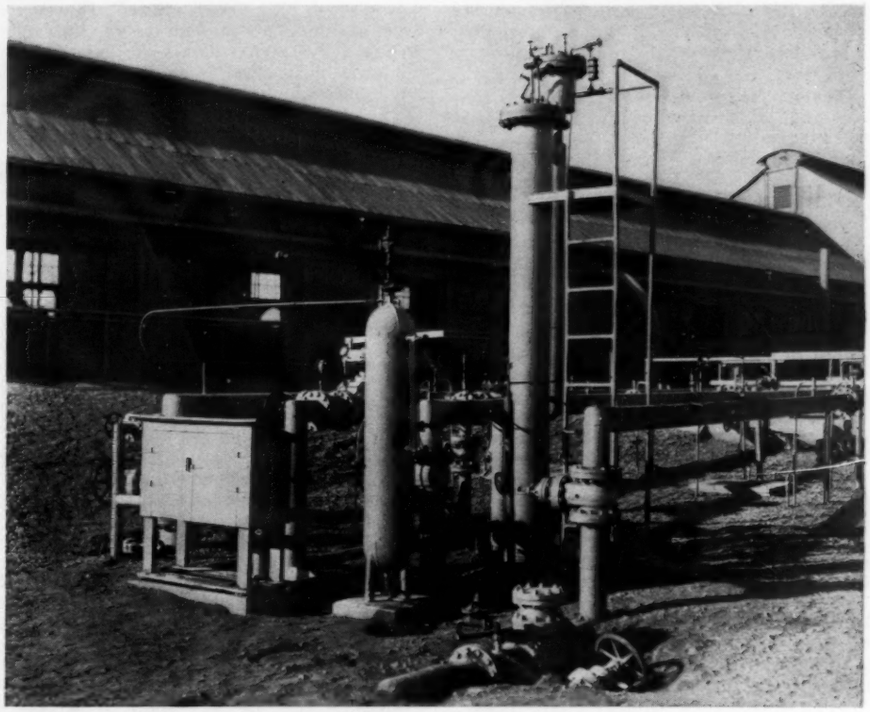


Fig. 7. Gas odorizer located at the Ventura compressor station of the Southern Counties Gas Company, odorizing gas for distribution at Santa Barbara, about 30 miles distant

Gas odorization has been disappointing in one respect; it has been of little material assistance in locating leaks in transmission lines and distribution systems. Evidently an odorant concentration sufficient to disclose even the smallest of leaks within an enclosed space is entirely inadequate for detecting any but large leaks in the open.

The reaction of the public to the odorization of gas has, for the most part, been favorable. In only a very few instances have we had consumers state that they were bothered by gas odors while lighting an appliance. As long as there is no leakage in a home, the consumer is not aware of the fact that the gas is odorized.

As yet, very little local publicity has been given to our odorization work. In spite of this fact, the odor imparted to the gas is recognized as a gas odor by the public, although the odor is actually more like gasoline than it is like gas. The number of cases where consumers have mistaken other odors for gas odors do not seem to have increased as the result of odorization.

V. Locations of Odorization Stations

The fact that the liquid warning agent is of sufficient volatility to permit its complete vaporization at transmission line pressures has made it possible to locate the odorization stations on transmission lines where large volumes of gas can be handled with one station, thus keeping the total number of stations required down to a minimum.

The problem of locating the odorization stations has been complicated somewhat by the fact that six operating companies have had to work out together a plan for odorizing all of the gas used for domestic purposes in the area which they supply. Natural gas for the city of Los Angeles and surrounding territory comes from 17 oil fields. Because these fields are located on all sides of the Los Angeles area, it has been possible in only one case to locate an odorization station at a transmission line junction where the station can handle gas from more than one source.

On the maze of transmission lines supplying the Los Angeles area there are located a number of very large industrial consumers who use from 2 to 50 million cubic feet of gas per day. These consumers would derive no benefit from the odorization of their gas, so it has been possible to effect a saving by locating odorization plants so that the gas going to these large consumers will not be odorized.

Between 35 and 40 odorization stations will be required. The largest of these will be located at Newhall and will handle about 92 million cubic feet per day, and the smallest will handle about 500,000 cubic feet per day. The locations of all stations are shown in Fig. 3. The gas odorant will be transported to all stations by means of a 1,500-gallon tank truck.

VI. Description of Odorization Stations

Since the number of leaks found bears a direct relationship to the quantity of odorant introduced, and one of the chief costs incurred by a utility that odorizes its gas arises from the cost of answering consumers' complaints, and since if too much odorant is used, a large percentage of the leaks disclosed are too small to be hazardous, it is important that the quantity of odorant used be rather carefully controlled. The use of too much of the warning agent increases operating costs and results in an unfavorable reaction from consumers who are subjected to discomfort by unimportant leaks. The use of too much of the warning agent

is also liable to result in the accumulation of the liquid in drips. It then becomes very difficult to blow drips without creating a nuisance.

These facts together with the further consideration that many of the stations must be unattended have led to the conclusion that an automatic device should be employed which would shut off the flow of a warning agent when the gas flow stops and which would, during the periods that gas is flowing, make the flow of the liquid approximately proportional to the flow of gas. Such a device has been developed and is shown in Fig. 4.

Essentially this device consists of a small orifice through which the liquid passes into the gas line, connected in parallel with an orifice in the gas line in such a way that the differential pressure across the liquid orifice is always the same as the differential across the gas orifice. As long as the static pressure remains constant, the flow of a gas through an orifice varies as the square root of the differential pressure. The flow of a liquid through an orifice also varies as the square root of the differential pressure. Consequently, after the correct relationship between the area of the two orifices has once been established, the proper ratio of liquid to gas flow is automatically maintained. This device is, of course, not exact in its operation, because at most stations the static gas pressure varies within certain limits; then, too, changes in temperature or in the gravity of either the liquid or the gas will introduce errors. However, for all practical purposes, the device has proven satisfactory during a period of operation of nearly a year.

In Fig. 5 a diagrammatic drawing of an odorization station is given. The odorant is hauled to the station in a tank truck and is dumped into the station's storage tank by gravity flow. A breather (6) line is provided from the top of the storage tank to the top of the truck tank to prevent the escape of odorant vapor into the atmosphere as the storage tank fills.

Liquid is transferred from the storage tank to the small run tank by applying enough gas pressure to the storage tank to lift the liquid into the upper tank. During this process, the run tank is shut off from the gas line and is vented to the atmosphere. The size of the high pressure run tank depends upon the quantity of gas handled through the station and upon the frequency with which the operator visits the station. In the larger stations, a run tank sufficient for one day's supply is used.

After the run tank has been filled and the valve shut between it and the storage tank, the top of the run tank is connected with the gas line, thus placing the line pressure on the surface of the liquid. The liquid can then flow from the run tank to the float valve chamber (3) by gravity. The liquid level in the float valve chamber is maintained at exactly the same level as the level of the orifice in the sight feed (4) by means of the float valve. The space above the liquid in the float valve chamber is connected to the gas line upstream from a gate valve (7). The down stream side of the liquid orifice in the sight feed is connected to the gas line downstream from the gate valve. The gate valve is throttled just enough to create a differential of a few inches of water when the maximum quantity of gas is flowing through the line. It is evident that when no gas is flowing through the line and there is consequently no drop in pressure across the gate valve, no liquid will flow into the line through the liquid orifice. However, when gas does flow through the gas line and creates a differential across the gate valve, this same differential is effective in forcing liquid through the sight feed orifice.

The desired ratio of liquid to gas is established by adjusting the size of the orifice in the peep sight (by changing the orifice spud) and by adjusting the position of the gate valve.

The float valve chamber is supported on an adjustable stand (9) so that the height of the chamber in relation to the peep sight orifice can be accurately adjusted. If the height of the float valve chamber is adjusted so that the surface of the liquid in it is at the same level as the orifice in the peep sight, the apparatus will function satisfactorily on a low differential. The differential across the gate valve need not be more than 15 inches during the periods of maximum gas flow.

If desired, the differential across an orifice meter can be used to actuate the odorizer. This practice has the disadvantage of requiring a change in the size of the peep sight orifice every time the orifice in the meter is changed. It has the advantage of not introducing an additional restriction to the flow of gas.

A needle valve instead of an orifice was used in the peep sight at first, but it was unsatisfactory because it clogged up easily.

A small chamber (5) made of a short piece of ½-inch pipe is located just below the sight feed. The exact volume of this chamber from the valve located just below it to a definite point visible within the sight feed, is known. A by-pass is provided around this chamber so that when the valve just below the chamber is closed, the pressure in the sight feed is not affected. By closing this valve and determining the time required for the chamber to fill with liquid, it is possible to determine quickly and easily the rate at which the odorant is flowing into the gas line. The rate of gas flow through the line is always obtainable from an orifice meter located either at the odorization station or near it. It is therefore possible at any time to check the ratio of liquid flow to gas flow.

Details concerning the construction of the float valve, the calibrated chamber and the sight feed are given in Fig. 4. In Fig. 6 a picture of one of these odorizers in operation is shown.

The odorization stations shown in Figs. 5 and 6 run the liquid into the gas line directly and depend upon the interior of the pipe line for contact surface between the liquid and the gas. Although our experience to date does not definitely prove that we will, under all conditions, be able to evaporate all of the liquid we introduce before it finds its way to drips, it does indicate that in most cases we will be able to obtain complete evaporation. Where conditions are unfavorable to the evaporation of the liquid—i.e., where the gas pressure is high (above 275 pounds per square inch), temperatures are low (below 60° F.) and there is only a short run of pipe line (less than a mile) between the odorizer and an important drip, it is probable that some special means should be provided for obtaining contact between the liquid and the gas. In Fig. 7, a photograph is shown of an odorization station in which a special contactor has been provided. This station is essentially the same as the one previously described, with the exception that the odorizer float valve and sight feed instead of being mounted directly on the gas line, are mounted at the top of a short rock-filled tower down through which the gas and liquid flow. Round, smooth rocks about 2 inches in diameter were used. The liquid spreads over these rocks and exposes a large surface to the gas. Although this station has been operated at as high as 400 pounds per square inch pressure and nearly enough liquid to completely saturate the gas has been introduced at the top of the tower, no evidence of unevaporated liquid having reached the bottom has ever been obtained, although provision was made at the bottom for catching any such liquid that came through.

Details concerning the rock-filled tower are as follows:

Height of tower.....12 ft.
Diameter of tower.....12 in.
Depth of rock filled section..... 9 ft.
Diameter of rocks.....2-3 in.
Over-all pressure drop through tower:

Rate of Gas Flow M.C.F. per Hour Standard cu. ft.	*Gage Pressure Lbs. per Sq. In.*	*Pressure Drop Lbs. per sq. in.*
110	250	0.83
133	250	1.27
145	250	1.59
175	250	2.30
201	250	2.96

A tower of this type large enough to handle 10,000,000 feet of gas or more a day would add considerably to the cost of an odorization station. For that reason, they will not be installed in any case until direct introduction into the line has first been tried and proven unsatisfactory.

If the odorization station is to handle only two or three million feet of gas per day, the run tank can serve as storage tank. The liquid can be pumped from the truck tank to the combined run and storage tank by means of a small hand pump mounted on the truck. The elimination of the storage tank effects a considerable saving in the original cost of installation.

A simplified odorization station for use where small quantities of gas are to be handled (one million feet or less) is now being developed.

VII. Cost of Gas Odorization

The liquid odorant costs $0.275 per gallon at the oil refinery. If three gallons of the odorant are used per million feet, the cost of the odorant per million feet is $.825. To this cost must be added the cost of transportation, cost of operating odorization stations, and fixed charges on the investment. These costs depend upon the quantity of gas handled and the location of the station, so no figure of general applicability can be given for the total cost of gas odorization.

The installed cost of an odorization station, including 3,000 gallons of storage capacity, is about $850. A small station requiring only 200 gallons of storage capacity will cost about $400.

The cost of handling leak complaints resulting from the odorization of gas is an item of cost equally as important as the direct cost of odorization.

TWO COMPANIES ASK TO SERVE LOVELAND, COLORADO

Two companies have filed applications for franchise rights in the town of Loveland, Colorado, according to recent report; the Citizens Gas Company, headed by John Handy, and made up of Loveland business men; and the Public Service Company of Colorado. Decision was expected during the last week in January.

P. G. *and* E.-Standard Line Project Announced

A JOINT statement was issued in January by the Pacific Gas and Electric Company and the Standard Oil Company to the effect that these two organizations have entered into an agreement under which they will join in the formation of the Standard Pacific Gas Line, Inc., for the purpose of constructing and operating the new 200-mile natural gas pipe line from Kettleman Hills to Richmond via Tracy and Pittsburg.

This agreement, by eliminating the necessity of duplicate pipe lines, which would militate against conservation of natural gas, will be to the economic advantage of the gas consumers of northern California, and means that the use of natural gas will be available for San Francisco and the East Bay by April 15.

The Standard Pacific Gas Line, Inc., according to news report, will supply Stockton, Sacramento Valley territory and Modesto, and Tracy in addition to Contra Costa County towns.

The line will be 26-inch diameter, with 138,000,000 cubic feet daily capacity.

It will provide Coast Counties Gas and Electric Company, subsidiary of Pacific Public Service Company, natural gas for distribution in its Contra Costa County territory, while Coast Counties consumers in Monterey, Santa Cruz, San Benito, and Santa Clara counties will secure natural gas from the present Kettleman-San Francisco P. G. and E. carrier.

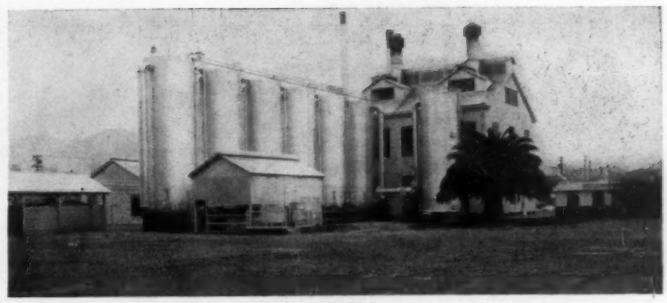
A branch line from Crockett, to serve P. G. and E. consumers in Napa, Solano, and Marian counties is seen as a future development.

This combination rounds out the scheme of natural gas service for central California and the San Francisco Bay area.

In connection with the announcement of the formation of the Standard Pacific Gas Line, Inc., A. F. Hockenbeamer, president of Pacific Gas and Electric Company, and K. R. Kingsbury, president of the Standard Oil Company of California, issued the following joint statement:

"The agreement reached between the two companies is in the interest of conservation and economy. It will save a duplication of pipe lines that would cost each company $8,000,000 to $9,000,000. It will also give the Standard an outlet for gas which it is now producing in the Kettleman Hills in large quantities. Making use of that gas is in itself a conservation measure of great value. Furthermore, the contract will give the Pacific Gas and Electric Company an assured gas supply and a call upon further supplies and reserves as they may be needed."

AT RIGHT: Production plant of P. G. and E. at San Rafael, California—winner of production plant classification in company "good housekeeping" contest.



Pacific Gas *and* Electric Co. Makes Yearly Awards

IN accordance with the plan inaugurated some years ago by the Pacific Gas and Electric Company, familiarly referred to as the "Good Housekeeping System," under which a number of ratings and awards are given to properties maintaining the best appearance in the Gas Department, the findings for the year 1929 were recently submitted by the General Ratings Committee and passed by W. S. Yard, vice-president in charge of gas construction and operation.

All of the ratings were very close. In some cases it was necessary to carry the percentage out to the second decimal point to find which property was in the lead. The results, however, are as follows:

Production Plants

		Division
First Place	San Rafael	North Bay
Second Place	Sacramento	Sacramento
Third Place	Marysville	Colgate

Holder Stations

First Place	Petaluma	North Bay
Second Place	Santa Rosa	North Bay
Third Place	North Beach	San Francisco

Meter and Regulator Shops

CLASS "A"

First Place	Sacramento	Sacramento
Second Place	San Rafael	North Bay
Third Place	Marysville	Colgate

CLASS "B"

First Place	Salinas	Coast Valleys
Second Place	Petaluma	North Bay
Third Place	Napa	North Bay

Premium Property of Respective Sections Regardless of Class

Northern Section—Marysville—Class "A" Meter Shop—Colgate.
Central Section—Petaluma—Class "B" Meter Shop—North Bay.
Southern Section—Salinas—Class "B" Meter Shop—Coast Valleys.

OKLAHOMA NATURAL TO GET SUPPLY FROM COLEMAN CO.

Oklahoma Natural Gas Corporation has contracted for an additional supply of natural gas from the Coleman County, Texas, gas fields. Among the producers with which the company has signed contracts in this field is the Texas American Syndicate, which recently completed its No. 2 well at a depth of over 4,000 feet, and with an open flow of over 15,000,000 cubic feet daily.

Oklahoma Natural is building a line from this field to serve San Angelo, Texas. This town is 12 miles distant from the company's main pipe line.

ARK. P. & L. TO GIVE SERVICE TO JONESBORO, ARK.

Arkansas Power & Light Company of Pine Bluff, Ark., soon expects to turn on gas at Jonesboro, Arkansas, through a line under construction from a point near Hoxie to Jonesboro. The line taps the Louisiana-St. Louis gas line at Hoxie. The company is expending more than $200,000 in the construction of city distribution system at Jonesboro according to press reports. A number of other towns are being supplied by the Pine Bluff company from the Louisiana-St. Louis carrier.

METROPOLITAN BOND & SHARE CO. GETS TEXAS FRANCHISE

The Metropolitan Bond & Share Company of Dallas, according to recent report, has obtained gas franchises at Zephyr, Mullin, Goldthwaite, Lometa and Lampasas, Texas, and expects to construct a 175-mile line from Brownwood, Texas, to serve these towns.

1929 SECURITIES TOTAL MADE KNOWN BY COMMISSION

Gas utility and electric company securities issued in California during 1929 totalled $72,233,842.66, according to a report of the California Railroad Commission made early in January.

OKLAHOMA UTILITIES ASSOCIATION TO MEET AT HOTEL TULSA

Headquarters for the 12th Annual Convention of the Oklahoma Utilities Association, to be held at Tulsa, Oklahoma, March 11-13, will be the new Tulsa Hotel instead of the Mayo Hotel as previously announced. Hotel Mayo's facilities are overtaxed, due to another convention holding session there at the same time.

T. R. Weymouth, president of the Utilities Association, has announced the appointment of the following committee chairmen to plan for and conduct the 12th annual convention of the association.

Convention—E. F. McKay; *Reception*—Frank Long; *Hostess*—Mrs. J. P. Arnold; *Exhibits*—O. D. Hall; *Entertainment*—J. A. Whitlow.

MOODY-SEAGRAVES OPTION ON GAS CO. PURCHASE EXTENDED

The option held by the Moody-Seagraves interests of Houston to purchase the Magnolia Gas Company has been extended, according to press report. The first option expired December 31. The Houston interests with their associates posted $1,000,000 several months ago for the option, it is reported.

SALES WRINKLES

"He Gains Wisdom in a Happy Way Who Gains it by Another's Experience" . . PLAUTUS

Bidding for Repeat Business

FRANK S. SHELL of the Southern Counties Gas Company's sales organization at Santa Monica, California, has applied one principle of retail selling to his own problem of developing a steady sales output. He believes that the repeat business is worth going after, and with this in mind saw the Christmas holidays as an opportunity to renew contact with his past customers. He relates his experiment as follows:

"Two weeks before Christmas of 1928, I used this good will and business getter. With the aid of my wife, who made them, we designed an attractive pot and pan holder of muslin—about eight inches square with sufficient padding on the inside so one could handle pans, etc., from the oven of the gas range.

"On the front was a design either stamped or sewed into the material and on the back a rubber stamp printed the words

> Christmas Greetings,
> Frank Shell,
> Southern Counties Gas Company.
> 'Phone 23275.

"A small brass ring was attached to one corner which allowed for hanging it on a hook. These were mailed to about 65 women who had purchased oven control ranges in the six months period preceding Christmas, and to others who had shown a desire to help me in suggesting friends who needed new gas equipment.

A LIVE SALESMAN'S REMINDER TO HIS GAS APPLIANCE CLIENTELE.

"The total cost of making each holder was 11 cents or $7.16 for those sent out, including envelopes and postage. Immediately following Christmas I began to get expressions of thanks for the novel and useful gift, and several customers telephoned their thanks. A few days later I made a sale of a new range resulting directly from this present, and the commission on it more than paid for the 65 gifts.

"By experience in my own home I found that a good, well-made hot pad is indispensable in a kitchen, and that they last at least a year.

"With my name and that of the gas company printed on the back do you think the recipient of such a gift would buy gas appliances from anyone else? Maybe some would, but the percentage would be greatly in my favor!"

—Frank S. Shell.

$10 for Every Sales Wrinkle Published

Reading the "Sales Wrinkle" pages of WESTERN GAS this month, the salesman and sales executive will be apprised of three ideas which ought to "register" on the prospect. They are:

1. A form of "closing" which should be avoided—and one man's successful way of getting around the situation.

2. An acceptable holiday reminder for the gas appliance salesman's clientele.

3. A suggestion for exchanging prospects with non-competitors who sell the same trade.

This month the following are wrinkle contributors:

Frank S. Shell, Southern Counties Gas Company, Santa Monica, California.

F. W. Lovell, Pacific Gas and Electric Company, San Jose, California.

I. L. Heckinger, Pacific Gas and Electric Company, San Francisco.

Send "sales wrinkles" to WESTERN GAS at the publication office, 124 W. 4th Street, Los Angeles, California. For each idea published $10 is paid. This offer stands until further notice, and anyone in the gas industry is eligible to submit wrinkles.

Use This One in Place of a Trite Close

BRANDISHING a pen over his prospect, and insisting in so many words that the latter "sign here" will not supply the ideal atmosphere for a sure-fire "close." That's the conclusion arrived at by F. W. Lovell of the Pacific Gas and Electric Company's San Jose Division. The phrase "Sign here" is known to be objectionable to many buyers, at least to those of average sensibility, so why supply that final bit of sales resistance? The way out is simple, according to Mr. Lovell, who supplies this method from his own experience:

"Practically all of our appliances require some sort of installation costs which are written into the sales agreement. Therefore, when the psychological moment is at hand, the request that the prospect *'kindly O.K. this installation order'* will make it easier to get the name on the dotted line.

"Try it—it works."

—F. W. Lovell.

A Two-Way Prospect Exchange

JUST another instance where enlightened self-interest finds an outlet is seen in a practice which I. L. Heckinger has adopted in his promotion of gas load through restaurant use. Exchanging prospects with salesmen in other lines who are interested in

pushing their products with the same prospect list, has been a business-getter for Mr. Heckinger in his San Francisco territory. Leads which he turns to others come back to him in concrete form. He sums up the benefits of this lead-exchanging plan in brief:

"I exchange prospects with the dairy man, bread man, pastry man, meat man, and all who sell restaurants. They are looking for new consumers and so am I. They get some I don't have and I get some they don't have; thus we help each other.

"This can be worked in any branch of the gas business: home heating, industrial, and domestic range sales."

—I. L. Heckinger.

EMPLOYEE LEADS ADD TO NEW BUSINESS TOTALS FOR P. G. AND E.

Employees of the Pacific Gas and Electric Company, with headquarters in San Francisco, California, have contributed appreciably to the merchandising sales totals for the past year by supplying new business prospects. Employee leads have aggregated more than 10,000 individual pieces of business during 1929.

H. W. GEYER NOW ON SOUTHERN COUNTIES INDUSTRIAL STAFF

H. W. Geyer, fuel and gas engineer, is now located in Los Angeles with the Southern Counties Gas Company. He has been contacting a number of gas appliance manufacturers in the East, and has recently returned to the general offices of the company.

Mr. Geyer is a graduate electrical engineer of Massachusetts Institute of Technology, and also completed work at the Graduate School of Fuel and Gas Engineering at the same school. He was formerly with the Philadelphia Gas Works Company, in the industrial division where he had charge of the industrial surveys for the company.

Since November 15, 1929, when he became affiliated with the Southern Counties Gas Company, he has been at the American Gas Association Testing Laboratory in Cleveland, the Servel refrigerator factory; the Consolidated Gas Company of New York, and many other Eastern companies in the interest of the Southern Counties Gas Company. Mr. Geyer is a member of the Competitive Fuels Committee of the A. G. A. He is also a member of the Steel Treaters Association.

NEW BUSINESS MANAGERS HOLD SESSION IN KANSAS CITY

New business managers of the Gas Service Company met with F. M. Rosenkrans, general new business manager of the company, at Kansas City on January 14, for an all day meeting at which plans were discussed for the new business departments for 1930.

Thomas F. Kennedy, general new business manager of the Doherty organization, and B. C. Adams, general manager of the Gas Service Company, were among those who gave inspirational talks to the assembled.

Several group plans of appliance selling, worked out by Mr. Rosenkrans, whereby a gas user buying one appliance, can, at a very small cost, select one or two additional appliances, will be put into effect during 1930. In March and April the company plans a combination range and water heater sale.

MARTIN HAS IDEA . . . WIFE HAS THE $10 PRIZE MONEY

The "Blue Blaze," official publication of the Lone Star Gas Corporation and subsidiary companies, has the following comment to make about J. A. Martin of the Lone Star Gas Company, Dallas, who furnished this department with an excellent wrinkle not so long since:

"Had an idea that won $10 in the Western Gas Magazine Sales Wrinkle contest, but Mrs. Martin had a better idea . . . she got the ten," says Jimmie Martin, referring to his recently printed idea of making salesmen out of leakage inspectors, printed in the December issue of *Western Gas.*

LAWRENCE TO MANAGE OFFICE AT MT. PLEASANT, TEXAS

Banks Lawrence has been named by the Southern Cities Distributing Company to head the office of the company at Mt. Pleasant, Texas. Mt. Pleasant was recently added to the list of Texas gas towns.

JOHN ECKL MANAGER FOR ARK. NATURAL AT STUTTGART

John Eckl has been placed in charge of the Arkansas Natural Gas Corporation office at Stuttgart, Arkansas, following the bringing of natural gas to that town in December.

This effective window guided radiant-type heater prospects to the special offer made by the Southern California Gas Company merchandising department in a March sales event on heaters

Staging a Radiant Heater Drive in the Month of March

By H. E. Davidson

Superintendent Appliance Sales, Southern California Gas Company

MAKING supply just equal the demand, the goal of the economist, is difficult enough with gas appliances in general, but with radiant heaters in Southern California it becomes almost an impossibility. Despite directed sales activities, demand is primarily determined by weather conditions, while supply is based upon the trade's estimate (or more properly, guess) as to what kind of a winter it will turn out to be. As a result, the dealer frequently finds himself in the early spring months with heaters on hand, and the usual result is a sale at cut prices.

H. E. Davidson

Last year the Southern California Gas Company decided to try a different plan, and in March put on a sale during which regular retail prices were maintained. Any radiant heater, however, could be purchased for $1 down and $1 per month until September, after which the balance was to be paid in five equal monthly installments. The low down payment encouraged many to buy heaters, although it was quite late in the season, while the small installments during the summer months practically eliminated repossessions and enabled the collection department to keep in touch with the purchaser until fall. By that time the heaters were again in use, and the larger monthly payments were collected without difficulty.

It is to be particularly noted in connection with the sales inducements offered for this March campaign that retail prices were held in force. In our opinion the gas company can ill afford to earn a reputation for price cutting, and in accomplishing its appliance selling mission should seek other means for supplying sales stimulus.

During our March event salesmen were allowed an additional commission on all radiant heaters sold during the month, in lieu of the customary prizes to those producing the greatest sales during a campaign. Newspaper advertising copy all featured the sale, but only the usual amount of space was used.

As a result of the month's work, about 170 heaters were moved out of stock and put to work in customers' homes—a really creditable showing for March, in view of the fact that in this month heater sales are ordinarily almost negligible, and that full retail selling prices were maintained.

RAY TROWBRIDGE GOES TO SEATTLE LIGHTING CO.

Ray Trowbridge, in charge of industrial gas sales for the Pacific Gas and Electric Company's San Francisco Division, has accepted a position with the Seattle Lighting Company of Seattle, Washington, and expects to leave for that city on February 8. Mr. Trowbridge will be in charge of industrial and househeating gas sales for the Seattle company.

On January 29, a farewell dinner was tendered to Mr. Trowbridge by his friends in the industry, at the Bellevue Hotel in San Francisco. Frank Talcott, divisional sales manager for the P. G. and E., acted as toastmaster for the occasion, and speakers included George Egleston, Andrew Kerr, Harold Basford, and Bob Grutzmacher.

An Industrial Gas Salesmen's Course Announced *by* A. G. A.

A COURSE in Industrial Gas Salesmanship, developed under the auspices of the Industrial Gas Section of the American Gas Association, is being offered by the Association.

The course is aimed to do for industrial gas salesmen what the A.G.A. course in Domestic Gas Salesmanship did for those engaged in domestic gas sales.

The course, which has been in preparation for the past several months, is now ready after completion of a field survey which furnished the source material. The Business Training Corporation, which prepared the course in Domestic Gas Salesmanship, also prepared the new course. A special committee of the Industrial Gas Section of the American Gas Association supervised its organization.

Following is the list of members comprising the special committee of the Industrial Gas Section of the A.G.A.:

C. C. Krausse, chairman, Managing Committee, Industrial Gas Section; D. W. Chapman, vice-chairman; H. A. Sutton, chairman, Educational Committee; C. W. Berghorn, secretary, Industrial Gas Section; George Bowersox, L. B. Crossman, Hugh Cuthrell, J. H. Gumz, Hall Henry, J. P. Leinroth, F. C. Mackie, R. L. Manier, N. T. Sellman, W. D. Thompson, L. E. Wagner, H. E. G. Watson, H. O. Loebell.

The aims of the course are as follows:

1. To give salesmen a more detailed grasp of the uses of gas in industry, and to show him how to make complete analysis of the sales possibilities in his territory.
2. To develop for salesmen a systematic procedure for uncovering each prospect's needs completely, instead of partially.
3. To provide salesmen with time-saving methods and equipment for conducting inspections, fact-finding interviews and tests in order that a larger proportion of time may be devoted to selling efforts.
4. To lay out for salesmen a planned, systematic and dynamic sales procedure applicable to all situations and thereby reduce the number of profitless calls.
5. To show salesmen how to educate customers and prospects to a consideration of fuels in terms of their ultimate effect on production instead of in terms of immediate cost.
6. To provide salesmen with facts and methods most efficient in overcoming competitive claims for coal, oil, electricity and liquefied petroleum gas when raised directly by prospects.

The course is divided into seven sections, or units. Each unit deals with a phase in the selling of industrial gas, and the text material is supplemented with illustrations, panel pages, check-up sheets and other aids.

UNIT I—Establishing Confidence and Control

The first unit gives a bird's-eye view of the planned sales methods and procedure employed by successful industrial gas salesmen. The unit tells how performance data may be secured, organized and presented so as to have the greatest sales-producing results. In detail it shows how the initial contact with industrial executives should be made in order to break down resistance, win the confidence and open the door wide to the sales story. It discusses practical methods of getting to the right man in the industrial plant, and short-cut methods for making quick sales.

UNIT II—Ascertaining the Prospect's Requirements

The second unit deals with the methods by which the salesman can secure the cooperation of industrial prospects in obtaining the complete facts about his heating needs most effectively. It guides the salesman in selecting arguments and outstanding needs for prospect's tentative consideration. It gives a definite working program for chceking prospect reaction to tentative proposals. Also, it provides practical methods for recording and analyzing the performance data so as to select a proper solution for the heating problems under consideration.

UNIT III—Presenting Your Recommendations

This unit draws together the procedures followed in preparation and presentation of proposals to industrial gas prospects. It starts by establishing a method of viewing the proposition from the prospect's standpoint. The unit details the most desirable ways of placing the story before the proper executives—orally and in writing—how to keep control of the interview or meeting, and how to turn each point of discussion toward the sales goal. It indicates ways for closing the sale, when possible, or of making the interview a definite commitment toward the final favorable decision.

UNIT IV—Explaining Technical Processes

Unit four shows how to make the explanation of technical facts contribute to the selling objective. It points out the ways of building from the prospect's present understanding of technical terms and subjects, toward a more complete knowledge of the essential facts which he should have—all with the sales angle. It suggests specific equipment—pictures, diagrams, etc.,—for making explanations of difficult points, and shows the best means for making demonstrations of apparatus at the sales room or plant.

UNIT V—Overcoming Difficulties

Unit five deals with convincing the "hard-boiled" prospect. Methods for handling indecisive and skeptical executives are given; procedure in meeting such difficulties as the refusal to see the salesman, the handicap of selling more than one executive, and personal interests or jealousies of the individual plant executive—these are all discussed. The problem of meeting competitive claims from other fuels is treated with facts and reasons. Special attention to means of closing difficult sales is given in this unit.

UNIT VI—Following Through

In this unit are shown the systematic methods followed by leading industrial gas salesmen in building up permanent, regular future business—of making each sale pave the way to others. Check-up calls on installations and other methods as a means of creating further good-will among customers; for leading to additional installations; for securing replacement business, are discussed. The step-by-step procedure for this is shown. Ways of reviving lost sales are also covered; and a special chapter is devoted to ways of keeping posted on industrial gas developments of value in generating more sales.

UNIT VII—Organizing Field Work

The final unit gives a plan for developing the sales possibilities of the salesman's territory. Methods of analyzing the field for immediate business—and from the most desirable load-building standpoint—are discussed. Many plans for developing sources of live leads are explained. In addition, there are chapters on the organization of time and efforts so as to make them more productive. The apportionment of time among various kinds of calls is also covered.

The fee for the course has been set at $50.00 for each person enrolled. Blanks may be obtained from The American Gas Association, 420 Lexington Avenue, New York City.

Changes *in* So. Counties District Sales Staff

THOS. G. ALLENDER, commercial agent for the Southern Counties Gas Company at Ventura, California, has been transferred to the San Pedro office of the company to take the place of N. H. King.

Mr. Allender started work for the Southern Counties Gas Company March 15, 1919, at Santa Ana and later was transferred to the city of Newport, where he occupied the post city forman. In 1922 he was transferred back to Santa Ana working in that district until the end of 1924, when he was made inspector of appliances and meters for Orange County. In 1928, Mr. Allender was transferred to Ventura District as district commercial agent.

T. G. Allender *Geo. F. Scherer*

George F. Scherer, chief clerk at Ventura under Mr. Allender, has been promoted to the post of commercial agent. He has just completed eight years of service with Southern Counties.

MODERN REFRACTORY PRACTICE EXPLAINED IN BOOKLET

Harbison-Walker Refractories Company of Pittsburgh, Pennsylvania, recently brought from the press a 178-page book entitled "Modern Refractory Practice," with special reference to the products of the Harbison-Walker company. A glance at the table of contents reveals the following chapter subjects: Fireclay Refractories, High Alumina Refractories, Silica Refractories, Magnesite Refractories, Chrome Refractories, Special Clays, High Temperature Cements, Duro Acid-Proof Brick and Tile, Export Department, Application of Refractories, Tables Useful in Application of Refractories, Formulae Useful in Calculating Brickwork, and General Information. Copies may be obtained from the company.

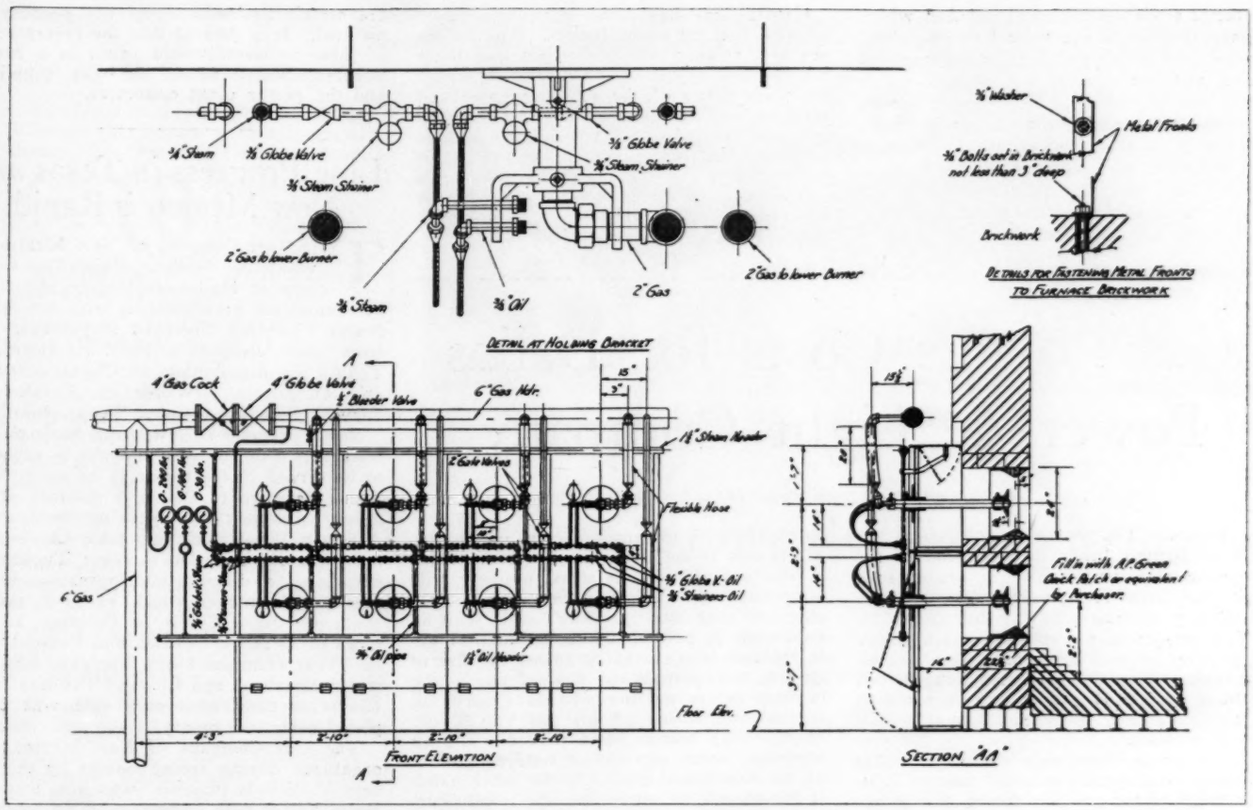


Diagram for installation of Forney combination gas and oil burner on boilers for Pacific Gas and Electric Company Station A, San Francisco.

All gas and oil piping and fittings to be 125 lbs. std., steam to be 250 lbs. std.

Deflector, shown in normal operating position, should be pushed in or pulled out so that flame just clears edge of brick work.

Diameter of outer cone, 23 in.; opening in front of furnace wall, 24 in., allowing 1 in. for grouting.

Sheet metal to be No. 12 gage iron (.1094 in.).

Steam-Electric Stations Equip *for* Gas

mechanical atomizing oil burners located in the front walls of the boilers. To equip these boilers for gas burning, it was only necessary to change the burners to the combination type and provide the necessary piping to bring the gas to the burners. With this type of burners the gas is admitted through a circular slot extending entirely around the firing arch, the gas being injected in a conical shape toward the center of the arch, where it intimately mixes with the air for combustion. In order to change from gas burning to oil burning, it is only necessary to insert the oil burner barrels and make the joints tight. Then shut off the gas burners one at a time and light the oil burners as the gas burners are put out.

RAPID CHANGE-OVER

Each of these boilers is equipped with 20 burners and the change-over from gas burning to oil burning can be made in approximately 15 minutes by one man, in addition to the fireman on duty. To change back from oil burning to gas burning, it is only necessary to shut off the oil burners one at a time and light the gas burners as the oil burners are shut off. This can be done in less than five minutes. The oil burner barrels may be moved out at leisure after all the gas burners are lighted.

The two large boilers at Station "C" are equipped with forced draft and induced draft fans. In order to safeguard the operation in case one of the fans should stop, a

(Continued from Page 32)

solenoid-operated valve is provided on the gas line so that the gas will automatically be shut off in case of failure of one of the fans. This valve can also be closed instantly by a push button in case the gas must be shut off quickly for any other reason. These boilers are also provided with automatic firing control which is designed to regulate the quantity of fuel and quantity of air for combustion in accordance with the demand for steam from the boilers.

The gas used at the steam stations is taken from the main supply pipes coming from the oil fields and the delivery pressure at the stations varies between 40 and 60 lbs. gage.

The pressure of the gas is cut down to 13 lbs. gage by a 10-inch reducing valve just before it enters the station for delivery to the boilers in a 12-inch header. This regulator is of the balanced valve type. The valve is operated by the regulated pressure working against a diaphragm. The regulated pressure is controlled by a weighted lever working on the same diaphragm in the opposite direction.

The gas is metered at each boiler through an orifice type meter. Unlike the usual meters, these meters do not record the quantity of gas used, but record the square roots of the absolute pressure of the gas on the upstream side of the orifice in pounds, and the square root of the differential pressure across the orifice in inches of water. The reason for this is that the various factors of measurement need correction from time to time. The quantity of gas in cubic feet per hour is determined from the following formula:

$$Q = C\sqrt{h.p.}$$ in which

Q = quantity of gas in cubic feet per hour.

C = orifice co-efficient corrected for pressure, temperature, and flow conditions.

h = differential pressure across the orifice in inches of water.

p = absolute pressure in upstream line in pounds per square inch.

"C" may be determined for a day or a week or any period of constant flow conditions, but "h" and "p" must be taken from the chart as the average of each hour. Since the chart reads the square root of these pressures, the calculations are greatly simplified.

The gas after leaving the meter passes through a gas chronometer valve where the pressure is cut down to from 1 to 6 lbs. gage according to steam requirements. The gas then enters a 10-inch header which runs across the lower front of the windbox from which 3-inch lines lead to each burner. The 3-inch lines are run to the burners inside the windbox, and the burner shut-off valves are all in a row across the windbox front at the boiler room floor level.

The automatic firing system will take care of the gas as well as the oil. This system is governed by the steam pressure in the main steam line by a master contactor. This

contactor sends out electrical impulses which engage clutches in the control drives. The control drives are on the gas chronometer valve and the forced and induced draft fans. Thus, if the steam pressure should start to fall the master contactor sends an impulse to the three control drives for more gas and more air. The finer adjustments of the air required for proper combustion are controlled by the air flow - steam flow relation of the boiler meter.

Natural gas has many advantages over oil as a fuel for steam boilers. The boilers are kept cleaner due to the fact that there are no soot deposits. This helps to lower the temperature of the escaping gases and tends to increase the efficiency. No smoke is produced when burning natural gas and no steam is required either for atomizing or for pumping and heating the fuel. No storage tanks are required and the difficulty of unloading oil barges is eliminated. Natural gas is indeed the ideal fuel.

Gas Lowers Costs for Dallas Power & Light Company

(Continued from Page 34)

the boilers. The Forney combination gas and oil burners being used to produce the proper combustion of this gas are of such type that in a few minutes time the use of oil may be substituted for that of gas.

The amount of gas consumed in a power plant over a period of one year is considerable. The daily consumption at this plant is over 10,000,000 cubic feet, resulting in an annual fuel bill of approximately half a million dollars.

In order to determine the daily boiler efficiency, the specific gravity and the heating value of the gas are determined by the use of an Edwards Balance and a Junkers Gas Calorimeter, respectively. To obtain a complete sample of the gas used during the 24 hours of the day, hourly samples are drawn in two five-gallon water filled bottles in such manner that at the end of the day each bottle will be filled with gas. These samples are used in the calorimeter determinations. As a check against the values obtained from these samples, two determinations are made using samples directly from the line. As it has been found that the specific gravity remains practically constant during the 24 hours, line samples are used in its determination. In order that the amount of gas consumed daily will be measured accurately, the orifice type meters used for its measurement are calibrated twice each month.

The first problem confronting the power plant man who uses gas is one which arises in his own plant, i. e., the subject of safety. The pipe, valves, fittings, and connections used in the line must be of material which will withstand the pressure and erosive effect of the gas. The line should be located so that there will be no collection of gas from leaks. Operators must be given instructions in the proper use of the fuel, maintenance men should be cautioned as to the proper tools to use when working on a line under pressure, and all employees are to be warned not to smoke or carry open fires in places where there is a possibility for gas to collect.

The effect of occurrences either on the pipe lines or in the fields is felt at the power plant. In some instances, the effect is immediate, while in others the time element enters. For example, if a pipe line were to break, or if for some reason or other the company supplying the gas were to shut off the supply without giving sufficient notice to the consumer, the boiler room operator would be hard pressed to change over to the stand-by fuel and at the same time keep up the steam pressure.

When cutting in a new line, the gas company should be extremely careful in flushing it. If this is not done, the boilers will get a "shot" of air and the steam pressure will begin to drop. This will perplex the fireman, for the fuel pressure gage will be indicating as before. If the amount of air in the line is such that it causes the fire to go out, then permits the flow of gas to the burners before the fireman has located the trouble and closed off his gas valves, the furnace may become filled with gas and an explosion occur due to the sudden ignition of the imprisoned gas. On the other hand, if the amount of air in the line is considerable, the effect is the same as a sudden failure in the gas supply.

Dirty gas is sometimes a problem in the power plant. Occasionally the gas will contain dirt, mud, grit, and even flint rocks. Clogging of the burners is the inevitable result and the burners must be immediately cleaned. This condition is made worse if there should be a drop in the pipe line pressure at the time of the clogging of the burners. In such a case, it is hard for the fireman to maintain the steam pressure, especially if he be the only operator on duty in the boiler room. At times it has been found necessary to change over to oil so that rocks could be removed from under the seat of the gas throttle valve.

Except for the fact that no explosions have taken place due to the ignition of gases unknowingly collected in the boiler furnaces, this plant has experienced the several inconveniences mentioned in the three preceding paragraphs. When a consumer is a public utility which at all times must furnish light and power for hospitals, street cars, public buildings, homes, etc., and is depended upon to do so, the gas supplying company should not only take particular care to provide a sufficient supply of gas but in case it is not able to do so, it should also, if possible, give the consumer sufficient notice to that effect.

The effect of other occurrences in the gas fields is also felt at the power plant, but the results are not dire. The cutting in of a well which produces a gas rich in heating value will show up at the power house when the heating value determination is made. If the value is unusually high, the person making the determination may be confused, thinking that he has made an error either in the method of the determination or in the calculation of the data observed. The effect of cutting in or out of gasoline extraction plants is the same.

In spite of the fact that the power plant man using gas does not have the many problems of the man using coal or oil, there are certain problems which are peculiar to his fuel. It is thought that the presentation of these problems would result in a better understanding between the gas suppliers and the power plant customers.

Line Progress *in* Texas *and* New Mexico *is* Rapid

THE Gas Company of New Mexico in which the Southern Union Gas Company of Dallas, is largely identified, has completed arrangements with the South Plains Pipe Line Company to purchase gas from this company's line at Hereford, Texas, for distribution at Clovis, Portales and Tucumcari, New Mexico, Texico and Farwell, Texas, and other Texas points.

Rapid progress is now being made on the construction of the line and gas is expected to be served in the towns at an early date. From Hereford to Clovis, a distance of 60 miles, an 8-inch line is being constructed. A 6-inch line is being laid from Clovis in a northwesterly direction to serve Tucumcari, embracing a distance of approximately 65 miles; and another 6-inch line will extend southwest from Clovis to Portales, a distance of 18 miles. Texico and Farwell will be served from the 8-inch line extending between Hereford and Clovis. The line from Clovis to the Texas state line was completed early in January.

The Gas Company of New Mexico was organized during recent months by the Albert T. Woods interests, who also own the Pecos Valley Gas Company. The Southern Union Gas Company of Dallas has lately purchased a large share of the stock of the company, and now has the management of the organization.

The South Plains Pipe Line Company, from which the gas will be purchased, is a subsidiary of the Prairie Oil & Gas Company, and the pipe line company supplying gas to the West Texas Gas Company, another subsidiary of the Prairie interests.

Another project being brought to completion by the Southern Union Gas Company is an extension of its gas line from the Raccoon Bend field in east Texas to Navasota. This line is of 5-inch pipe and is approximately 30 miles in length.

The Arkansas Western Gas Company, also controlled by the Murchison interests of Dallas, who own the Southern Union Gas Company, has brought to completion its 65-mile, 8-inch line from the Clarksville, Arkansas, gas fields to Fayetteville, Arkansas. The Arkansas Western system will embrace approximately 120 miles of main line upon completion, with lines being extended from Fayetteville to serve Springdale, Rogers, Bentonville and other northwest Arkansas towns. Five inch and 4-inch line makes up the system from Fayetteville to the other towns.

Gas is being purchased at Clarksville from the Arkansas-Louisiana Pipeline Company, a subsidiary of the Arkansas Natural Gas Corporation—in turn a subsidiary to the Cities Service organization.

DISTRIBUTION STATISTICS FORM PART OF U.S. ANNUAL CENSUS

A distribution census is to be made a part of the Fifteen Decennial Census of the United States Government which is being made in 1930. This distribution census is the first nation-wide gathering of statistics of retail and wholesale trade ever attempted by the government.

1930 Calendar

Pacific Coast Gas Association—Mid-Winter Conference of Commercial Section, Los Angeles, Feb. 6, 7, 1930.

Pacific Coast Gas Association—Mid-Winter Conference of Technical Section, Los Angeles, February 20 and 21, 1930.

Southern California Meter Association—February 27, 1930.

Oklahoma Utilities Association—Tulsa, Oklahoma, March 11-13, 1930.

Arizona Utilities Association, Pacific Coast Gas Association—Joint Conference, Arizona Biltmore, near Phoenix, April, 1930.

Mid-West Gas Association—Waterloo, Iowa, April 14-16, 1930.

Southern Gas Association—Savannah, Ga., April 22-24, 1930.

Southwestern Gas Measurement Short Course—Norman, Oklahoma, April 15, 16, and 17.

A.G.A. Natural Gas Dept.—New Orleans, Louisiana, tentatively scheduled for May, 1930.

Canadian Gas Association—Halifax, Nova Scotia, June 24-25, 1930.

Pacific Coast Gas Association—Huntington Hotel, Pasadena, Calif., September 9-12, 1930.

American Gas Association—Municipal Auditorium, Atlantic City, N. J., October 13-17, 1930.

WALTER M. BERRY RETURNS TO COAST AFTER TRIP EAST

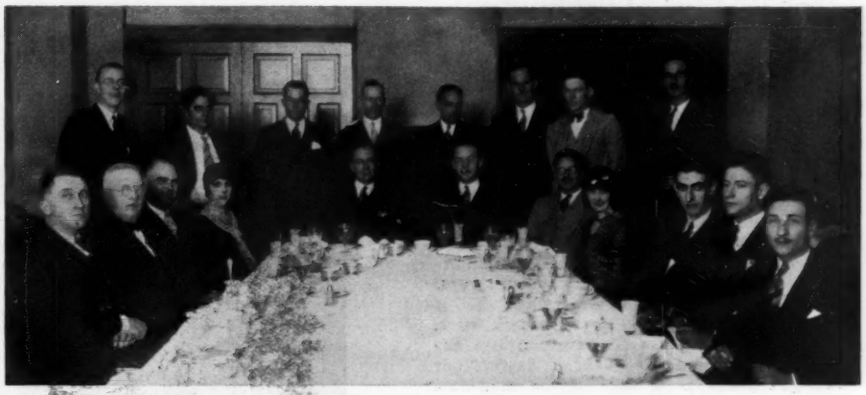
W. M. Berry

WALTER M. BERRY, consulting engineer of Los Angeles, California, left that city early in October for a combined business and pleasure trip to Cleveland, Ohio, and other eastern points. While there he was chiefly concerned with the interests of Los Angeles manufacturers who are applying for the American Gas Association Laboratory's approval on their appliances.

Mr. Berry made the trip east by motor, returning over the southern route.

G. W. WADSWORTH RETURNS TO SO. COUNTIES GAS COMPANY

G. W. Wadsworth, Jr., who prior to 1927 was secretary to F. S. Wade, vice-president and general manager of the Southern Counties Gas Company, returned to employ with the Southern Counties during the month of December, 1929. Mr. Wadsworth in 1927 accepted the post of assistant financial advisor in the American Financial Administration for the Republic of Haiti. He completed six years of service with Southern Counties prior to his departure for Haiti.



Commercial department of Texas Cities Gas Company at El Paso Texas, in banquet session

El Paso Utility Reviews 1929 Sales

TO CELEBRATE a year of active sales work, and to lay plans for 1930, the commercial department of the Texas Cities Gas Company at El Paso recently met around a banquet board, presided over by C. K. Patton, general commercial manager of the Texas Cities company, which has headquarters at Dallas, Texas. R. S. Reading, manager of the company at El Paso, was called upon to sound a keynote for the sales force for 1930.

Natural gas was turned on in El Paso around the middle of June through a 200-mile line originating in the Lea County gas fields in Southeastern New Mexico. On July 1, gas appliance sales for the year had totalled approximately $50,000. From July 1 to December 31 merchandising sales amounting to approximately $210,000 were made, bringing the total for the year to $260,000.

This volume of business is made up of 849 gas ranges, 330 water heaters, 1956 space heaters, 223 radiators, 46 circulating heaters, 206 furnace conversion burners, 15 new gas furnaces and 1211 houses piped for the use of gas for portable heaters. It was pointed out that in addition to the business secured by the gas company that a considerable volume of business was also secured by other firms in the city handling gas appliances.

At the time that natural gas was turned on in El Paso (which, incidentally, was the last city in Texas to turn from artificial to natural gas) there were 13,000 meters in use there. More than 14,000 meters are now on the lines.

Throughout the period since natural gas was turned on, the gas company has concentrated on central house heating jobs. In addition, special merchandising campaigns were held in July and August on radiant type heaters and housepiping, and in September on ranges and water heaters. In October activity centered on all kinds of heating appliances, with November being given over to heating appliances and ranges and December to general appliance work.

Each campaign was well advertised through the use of newspaper space as well as by direct-by-mail pieces. The city itself, according to Mr. Patton, was divided into nine districts, with salesmen actively working each district.

In addition to domestic heating jobs, the Texas Cities Gas Company of El Paso has been very active in the sale of industrial heating, following the turning on of natural gas. Among the industrial jobs secured by the company, and one pointed to with pride, is a contract for the heating of 25 city schools composing the entire city school system.

In the picture, reading from left to right, standing, are: E. H. Ronsick, industrial engineer; N. F. Lucero, manager of the Juarez Gas Company; Carl Byrd; C. H. Price, sales supervisor; F. Silva; George Hargrave; W. E. Boyd; M. B. McLean. Seated are, left to right: F. P. Osborne; L. A. Lamson; Joe Caldwell; Mrs. E. Stuart; R. S. Reading, manager; Texas Cities Gas Company, El Paso; C. K. Patton, general commercial manager Texas Cities Gas Company, Dallas; W. Frederick; Mrs. Yarbough; J. M. Young; J. E. Ketner, Jr.; E. Revilla.

SPRAGUE METER BUYS NEW FACTORY SITE

Sprague Meter Company has purchased a factory site on Kings Highway in Fairfield, Connecticut. Plans for the building call for a two-story brick structure from 350 to 400 feet long. The new factory will be modern in every detail, according to the vice-president, W. P. Hutchinson.

COOPER-BESSEMER CALENDARS ARE AVAILABLE

The Cooper-Bessemer Corporation, with headquarters at Mt. Vernon, Ohio, announces that a limited number of the company's 1930 calendars are still available, and may be had by sending a request to the above address.

RESERVE OFFICERS WANTED FOR PROCUREMENT SERVICE

The War Department at Washington, D. C., according to a letter signed by Colonel James D. Fife, director of the Planning Branch of the Medical Corps, desires an additional number of reserve officers for assignment to various units in the Procurement Service of the United States Army.

COAST COUNTIES WANTS PERMIT AT AVENAL, KINGS COUNTY

Coast Counties Gas and Electric Company, with headquarters at Santa Cruz, California, has received authority from the Railroad Commission of California to distribute gas in Avenal, Kings County, California.

Measuring Distribution Operation *by* Man-Days

(Continued from Page 27)

In all kinds of labor where individual performance is the basis of operation, some form or kind of time unit is obviously necessary in order to intelligently control the work of the department or organization. The indiscriminate use of the term "day" is too broad to permit intelligent or close supervision. To use the hour as a unit narrows the time limit too closely when several operations requiring varying periods of time are performed during the day's work. It is, therefore, most desirable to use the generally accepted period of a day's labor or eight hours as a basis of the man-day. With the acceptance of a unit base of performance, the comparison of work in kindred organizations is made easy and a friendly spirit of competition can be produced.

HENRY C. DAVIS DIES IN AUTOMOBILE ACCIDENT

Announcement was made on January 10 of the death of Henry C. Davis, whose death resulted from injuries received in an automobile accident on January 5. Mr. Davis was for many years connected with the Doherty interests. When Cities Service Company took over the old Natural Gas & Fuel Company, Mr. Davis was put in charge at El Dorado, Arkansas. At the time of his death he was with the McMillan Petroleum Company of Los Angeles, California.

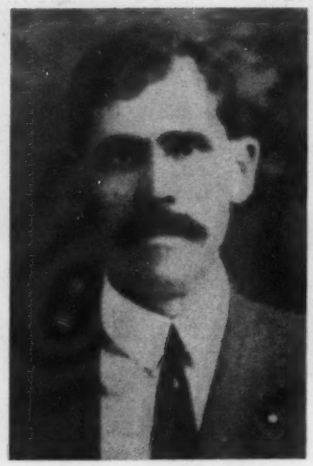
Campbell Heads Pacific Service Employee Body

E. G. CAMPBELL, assistant superintendent of the gas distribution department of the Pacific Gas and Electric Company with headquarters in San Francisco, California, has been named to head the Pacific Service Employees Association for the coming year. The Association includes in its membership employees of the Pacific Gas and Electric Company. W. F. Pape, general foreman for the company, was named vice-president, and J. C. Carmody, executive secretary and treasurer.

E. G. Campbell

Mr. Campbell has named the following committee chairmen to carry on the work of the Association for 1930:

Advisory—Van E. Britton.
Finance—W. F. Pape.
Social Activities—J. Dunlop.
Educational—R. D. Shea.
Benefit and Loan—F. Talcott.
Publications—Bertha J. Dale.
Membership—W. E. Kelly.
Property and Athletics—E. W. Deane.
Reception—Philip Riter.
Women's Affairs—Myrabelle West.
Publicity—J. Chas. Jordan.



Louis Lock, pioneer gas man in the Monroe, La., area

Memorial *to* Louis Lock

THE Civic Club of Monroe has under way a movement to build, as a memorial to Louis Lock, pioneer of the gas industry in the Monroe fields, a drinking fountain in a central location of the city of Monroe, Louisiana. The fountain will be illuminated at night with the fuel which Mr. Lock was instrumental in discovering.

The recent remodeling of an old building in Monroe brought to memory the story of the discovery of the Monroe gas fields, when a photograph of Mr. Lock was unearthed. From a photostatic copy of this portrait the illustration above was reproduced.

Mr. Lock's name will always be identified with Monroe gas development, for it was through his efforts to bring in an oil well in that locale that natural gas was first discovered there. In 1916, while a resident of Monroe, he induced the townspeople to invest in his well. The well, on August 23, 1916, much to his disappointment came in as a "gasser" with an unusually large flow. A franchise was secured for distribution of the fuel in Monroe, and thus a great development was given impetus.

Mr. Lock died in 1918, but the work he started has continued, and there are now 700 wells in the field.

TIME-O-STAT COMPANY HOLDS ANNUAL CONVENTION

The First Annual Convention of the Time-O-Stat Company convened in the Hotel Elkhart, Elkhart, Indiana, January 15-18, and was attended by distributors of the Time-O-Stat Controls Company from all points of the United States and Canada.

At the introductory meeting an address of welcome was delivered by Julius E. Luthe on behalf of the company, and each of the distributors. Executive members of the Time-O-State Sales, Production and Engineering Departments were introduced to the delegates.

Immediately following the introductory session, the group of approximately 100 men was taken to the modern daylight plant of the Time-O-Stat Controls Company. It required about two hours for the inspection.

The keynote of the entire convention was optimism for the year 1930, and the meetings were designed to give the various distributors an outline of the sales program for the year, as well as to interest each of them in making 1930 the biggest year in the company's sales history.

Selling Water Heaters *by* Specialization

(Continued from Page 36)

value to the salesmen that plans are under way to place additional men from the merchandising department with the six men who are now veterans at the game, for the valuable training that these new men will obtain.

Another valuable feature in connection with the sale is this:

Despite the fact that the sale features and advertises only one model of the Pittsburg line, that being the new Walker-Pittsburg water heater, this is not the only model that is sold during the sale. The salesman takes special care to sell only the heater that will do the job satisfactorily. In some cases he has trouble in diverting the sale from the advertised product, and as a last resort sometimes has to refuse to sell anything but that which will give satisfaction. A man from the Pittsburg Water Heater Company accompanies the crew of six from town to town, to assist them with the sale and to act as advisor on any problem that may arise.

An additional attention-getting feature of the 5-ton truck that bears the calliope deserves mention. On the rear of the truck a continuous flow of water is arranged, circulating from a barrel through a pipe to which a faucet is attached. The faucet, which is located above one of the water heaters, pours the water back into the barrel. The latter contains soap, and the action of the soap and water causes the forming of myriad bubbles which blow from the barrel as the truck makes its rounds.

After the truck and calliope have touched every section of the town the driver stations the truck in front of the gas office, where it continues to advertise the water heater sale.

The sale plan calls for a small payment down and allows the consumer a period of 18 months in which to pay for the heater.

Chester L. May, superintendent of the Community, estimates that it will take about 12 months to complete the rounds of the towns served by the company.

R. C. Cavell Named Pres. *of* Employees Ass'n.

THE Employees Association of the San Diego Consolidated Gas and Electric Corporation of San Diego, California, recently held an election of officers, at which time R. C. Cavell was named president for the ensuing year. The new president whose election was unanimous has been an active participant in all affairs of the organization, and has been generous in devoting his time and offorts toward building it up. Other officers elected at the meeting were: Otto Goldkamp, vice-president, and R. B. Tallman, secretary-treasurer. Directors named for the coming year are: R. A. Edwards, gas distribution; H. E. Randall, meter readers; A. T. Peterson, shops and stores; Wm. Hill, transportation; W. A. Smitherman, electric distribution; T. P. Garrett, electric meters; and E. A. Balle, special construction.

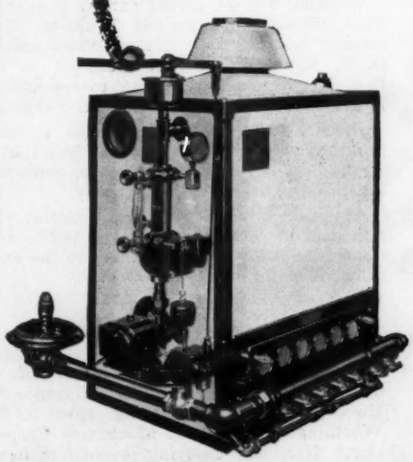
R. C. Cavell

EVERY MONTH MILLIONS OF MAGAZINE READERS LEARN ABOUT IDEAL GAS BOILERS

NOW is the time to sell

IDEAL GAS BOILERS

Now is the time to sell automatic heating when the disadvantages of old-fashioned heating are fresh in the minds of home owners. You can make the installation later on, but now is the time to get the order. A recent survey shows that right now more than twice as many home owners are contemplating the purchase of gas boilers. Sales come easy with Ideal Gas Boilers because everyone accepts an American Radiator Company product as the standard of quality.



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sold by

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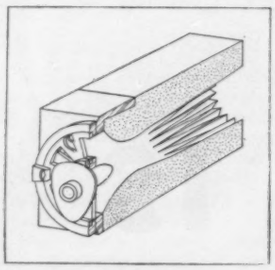
EVERY MONTH MILLIONS OF MAGAZINE READERS LEARN ABOUT IDEAL GAS BOILERS



Get hotter flame with this burner

D. F. C. high temperature atmospheric gas burners give positive flame and volume control. Riflings of clay throat become incandescent, accelerate combustion and produce higher temperatures. Write to engineering department for complete data.

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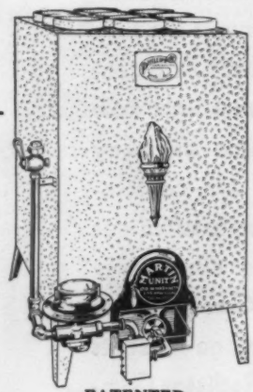
Denver, Colo. U. S. A.

Branches at Salt Lake, El Paso, and New York



PATENTED

Martin Unit Gas Furnaces

ARE THE RESULT OF 38 YEARS HEATING EXPERIENCE
MADE IN FOUR SIZES

Electric, Thermostat or Manual Control
Approved by A. G. A. Laboratory and by the City of Los Angeles

Write for your copy of "Modern Heating Methods"

PHILLIPS HEATING, VENTILATING & MFG. CO.
1710 W. Washington St.
Los Angeles, California

Live Agents Wanted

TESTING LABORATORY A.G.A. APPROVED

Natural Gas *for the* South

(Continued from Page 31)

ual sales of from 70 to 75 M.c.f. per customer per year, the load factor on domestic business will be 27 per cent to 30 per cent.

The computation of pressures on a long line with gas taken off at many points is no simple matter, but may be made less complicated by use of the methods employed by the designers on this work, which are illustrated by an example below. Weymouth's formula was employed in the form.

$$Q = C\frac{P_1^2 - P_2^2}{L}$$

where

Q = cubic feet per day
C = coefficient dependent upon inside pipe diameter
P_1 = upstream pressure pounds absolute
P_2 = downstream pressure pounds absolute
L = length in miles.

The equation above may be written

$$\frac{Q^2L}{C^2} = P_1^2 - P_2^2$$

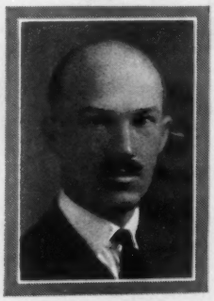
in which form it is more convenient to handle and in which form all calculations may be made on an ordinary slide rule if one has available a table of values of C for various sizes of pipe. Starting at the outlet end of the system and working back towards the inlet the calculations for the layout shown by Fig. 2 are made as given on Form No. 1. (See Page 31 for Fig. 2 and Form No. 1.)

Meter stations for both city gate stations and industries are in general displacement meters up to loads where three of the largest size meters are insufficient, above which orifice meters are used with duplex differential gauges where load variation is large. Meter and regulator station designs and pipe line capacity calculations were by C. W. Merriam.

River crossings are by multiple lines, usually three 12-inch with provision for the fourth, but with six 10-inch lines at the Mississippi River, with provision for an additional six lines.

Southern Counties Sets $932,000 Sales Quota

SOUTHERN Counties Gas Company held its annual sales banquet on January 13 at company headquarters in Los Angeles. District managers, sales executives and salesmen throughout the company territory were all present for the banquet, which took the form of a "turkey-and-bean" dinner. Clyde H. Potter, commercial manager for the company, presided over the evening program.



Clyde H. Potter

To stimulate competitive selling during 1929 the eight districts of the company, containing a total of 130,000 meters, were matched against each other, with the condition that at the end of the year victors would eat turkey at the expense of losers, the latter eating beans. This was the order of the day on January 13, with the important exception that after a few courses of beans for the losers the company management stepped in and provided turkey for all hands around, as a recognition of the sterling sales results set up during the year.

A total sales quota of $800,000 in gas appliance merchandise was set at the beginning of 1929. In making its quota the company set up a high mark for sales within any one week. On December 22 the system was $22,000 behind its quota. Concentrated, day-and-night selling brought $39,000 in merchandise sold for the final week's work, putting the system $17,000 over its goal.

Here is a comparison of 1929 and 1928 appliance sales:

	1929	1928
Ranges	3,000	3,900
Water heaters	1,867	1,501
Refrigerators	752	179
Heating (radiant-type heaters, radiators, unit furnaces)	3,617	3,129

This year something different is being done in the way of quota setting. Ordinarily the management sets quotas, but Southern Counties has introduced the experiment of allowing the sales force to set its own mark to shoot at.

For 1930, the merchandise quota totals $932,000. The system has been divided into two teams of four districts each, instead of each district being in individual competition against all others. A year hence when results are added up, another sales banquet will be held, and the winners will eat Mallard duck, while the losers regale themselves upon good old fashioned braised bologna.

During the January 13 "turkey-and-bean" dinner an advertising portfolio reproducing a number of the special pieces of copy which will be run in 1930 was distributed to those present.

Headliners on the entertainment for the evening were Bert Butterworth, chief announcer for Los Angeles radio station KNX, and his Optimistic Doughnut Colored Singers, of radio fame.

Speaking for the turkey eaters, Walter G. Rich, district manager at Whittier, California, lauded the victors' sales efforts. O. R. C. Grow, district manager at San Pedro, represented the bean eaters and set up a challenge for next year's sales showing.

District sales managers on the speaking program were H. M. Wilcox of Santa Monica and C. D. Scott of Monrovia, representing turkey and beans respectively.

Frank H. Bivens, Southern Counties vice-president in charge of sales and public relations, also spoke, paying tribute to the entire sales force for the year's work.

CLARENCE W. HODGES DIES ON JANUARY 17

Announcement has been made of the death, on January 17, of Clarence W. Hodges, general purchasing agent of the Worthington Pump and Machinery Corporation. Seemingly enjoying the best of health, Mr. Hodges was taken suddenly ill and died at the Paterson (N. J.) Hospital as the result of an operation. He was 53 years old.

Color Sells

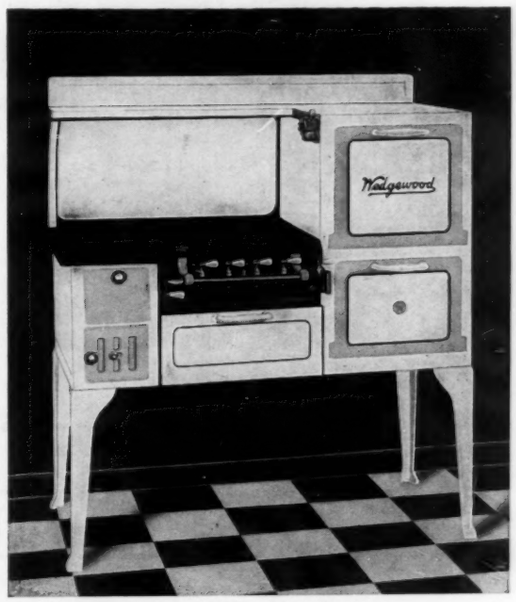
When Other Features Fail

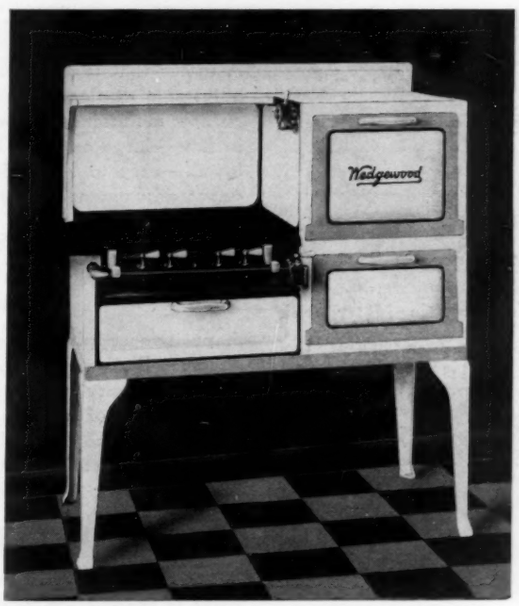
Color is the dominant factor in the replacement of GAS Ranges today. It moves the old stove out of the kitchen when nothing else will.

Wedgewood, resplendent in its favorite combination of soft ivory and cool green, fits into any modern ensemble and offers an irresistible sales appeal.

Wedgewood's quality appeal is another outstanding sales help.

The line includes every type of gas cooking equipment from a two-burner gas plate to a six-burner, two-oven, large family size range, with oven heat control, enameled oven linings and stainless, rust-proof Closed-Top.





Hear Ann Holden's Newest Cooking Recipes

Listen to the Wedgewood Program every Tuesday at 11:10 a. m., KGO, KPO, KFI, KGW, KHQ, KOMO.

Enjoy the Wedgewood Little Symphony Orchestra, and other NBC artists.

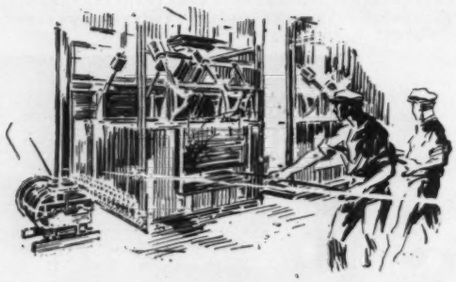
Wedgewood

Quality-Service Since 1882

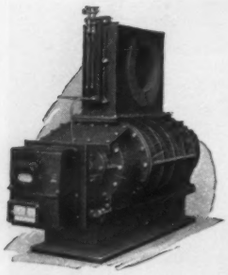
JAMES GRAHAM MFG. CO.
LARGEST STOVE MANUFACTURERS IN THE WEST
GAS RANGES - COMBINATION RANGES - RESTAURANT RANGES
GAS PLATES - WATER HEATERS - ROOM HEATERS
San Francisco Los Angeles Newark, Calif.

A Wedgewood For Every Purse

OVER A MILLION WEDGEWOOD RANGES IN USE!



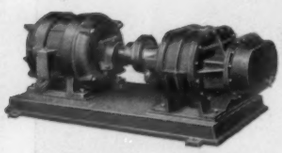
Dependable Aids for your Industrial Installations



Connersville Meter with Demand Recorder

Connersville Meters

A meter that is all metal with an unvarying non-adjustable displacement machined into it—the accuracy maintained throughout extreme variations in flow—large capacity in a single meter—easy to install—easy to read—free from the need of frequent adjustment or repairs. Description in Bulletin 4D and 305.



Victor Air Blower or Gas Booster

Victor Positive Rotary Blowers

A positive supply of air from the Victor positive Pressure Blower is an excellent aid to satisfactory gas burner service. There is a Victor Blower for any volume of air from 5 C.F.M. and larger. Bulletin 121 contains the ratings, R.P.M., power requirements, etc., of these Victor machines.

Victor Gas Boosters

When your industrial consumer requires gas pressures at the burners, higher than are carried in the mains, a Victor Gas Booster will economically increase the pressure for this user, giving him a positive supply of gas that may be easily controlled at an even pressure. Bulletin 233 describes the special construction features of Victor Gas Booster.

A post card with your name and address will bring any of these bulletins to you.

The Connersville Blower Company

Michigan Ave. at 16th St.

Connersville, Indiana.

CONNERSVILLE

Blowers-Gas Pumps-Meters-Cycloidal Pumps

Installation *and* Operation *of* Pumps

By J. S. DUNN

Columbian Gasoline Corporation
*Monroe, Louisiana**

PUMPS should be installed in a light, dry, warm and clean room and should have the best possible attention. The pumps should be installed so as to be accessible for inspection during operation; there should be ample room so an overhead crane or hoist can be used in lifting heavy parts. Pumps should be installed as near the source of supply as possible. The liquid reservoir should be elevated so that when the suction valve is open the liquid will flow by gravity; the pump will then be self-priming.

Pumps should be installed on substantial foundations. Concrete, brick or stone make reliable foundations. Concrete built up from the ground seems to be most generally used. All foundation bolts should be located according to drawings or templates. The erection of pumps should be handled by a thoroughly skilled and competent man. The base of the pump must be placed upon the foundation and suitable leveling wedges of iron or steel placed at proper intervals. This is done to support the load solidly without springing.

The alignment of pumps must be accurately and permanently established if successful operation is to be secured. Pumps of large size should be piped with flanged joints and good grade gaskets. On small pumps the screw type of joint is often used. Care should be taken to support the suction and discharge piping properly, so that no strain can be put on the pump from either its weight or expansion. Pipe strains are very often the cause of misalignment, hot bearings, warm couplings and vibrations.

It is not necessary to take 12-inch and smaller centrifugal pumps off the bedplate while leveling up. Larger sizes should be removed from the bedplate until they are leveled.

In truing up a coupling, clean off all the paint and burrs, use a straight edge and a set of thickness gauges. When the couplings are perfectly true on both faces and outside diameter and are of the same diameter the exact alignment will show the distance between any points on the faces. A straight edge will lie squarely across the rims of both halves at any point.

Too much attention cannot be given to the suction conditions of any pumping installation. Failure to observe different rules relating to the suction of a pump means the failure of the installation. It has been demonstrated by experiment that the pressure of the atmosphere at sea level is 14.7 lbs. per sq. in. This experiment, conducted in the year 1643, was for the purpose of overcoming suction troubles with the pumps at the estate of the Duke of Tuscany. The actual suction lift that can be attained in practice is limited by the temperature of the liquid, the friction of the liquid through pipe and fittings and leakage of air through joints of the suction pipe. There is also a reduction due to velocity and entrance heads. As the altitude increases the atmospheric pressure decreases, resulting in a decrease of the possible suction lift. All parts of pumps where there is any friction should be well oiled at all times; steam cylinders should be well lubricated, especially before starting,

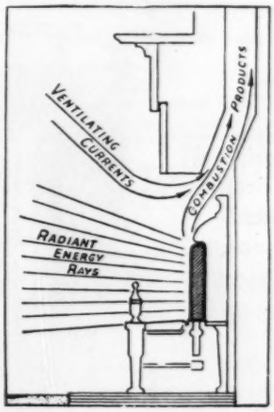
*Presented at Columbian Gasoline Corporation Foremen's Meeting.

Selling Radiant Heat

A Practical Page for Appliance Salesmen

No. 2

What is Radiant Heat?



The diagram answers the question: What is radiant heat? How does it warm the room? How does it assist in ventilation?

If this sounds like old stuff, answer this question: Will radiant heat warm an object if its rays are thrown through a solid block of ice?

Radiant heat is the kind of heat given off by a glowing wood or coal fire in a grate, by the sun, or by a radiant type heater.

It leaves its source in direct rays and is unaffected by air currents. It has no warmth until its rays touch the objects that lie in their path. These objects then become warm and in turn throw off another type of heat, called convected heat.

Convected heat, the only kind that comes from any non-radiant heating device, relies on warm air currents, rising to the ceiling and circulating through the room to convey the warmth.

The old type of fireplace heaters, gas log and asbestos front, were appliances for heating air. They succeeded mostly in heating the air in the chimney, unless the draft were checked down to the place where both heat and products of combustion came off into the room. Vitiated air, and water dripping from the window panes were the penalties paid for any kind of warmth at all. Is it any wonder gas heating got a black eye?

Radiant type heaters, and particularly the Humphrey super combustion burner in the Humphrey Radiantfire, have changed all this. The gas is consumed perfectly at the highest flame temperature, heating the radiants and the backwalls to a glowing red that generates the maximum radiant heat. Combustion products go straight up the chimney, and by drawing in air currents from the room, actually ventilate it.

Tell your prospect this. The air is **better** in a room where a Radiantfire is burning, than it is in a room where there is no fire at all.

And incidentally, rays of radiant heat will pass through a block of ice and warm an object on the other side, just as easily as the rays of the sun pass through a glass window and warm the inside of a room on a cold day.

The HUMPHREY Radiantfire
TRADE MARK REG. U.S. PAT. OFF.

Pacific Coast Manager
C. B. Babcock Co.,
135 Bluxome St.,
San Francisco

Manufactured by
General Gas Light Co.,
Kalamazoo,
Michigan

Electrogas

FLOOR FURNACES

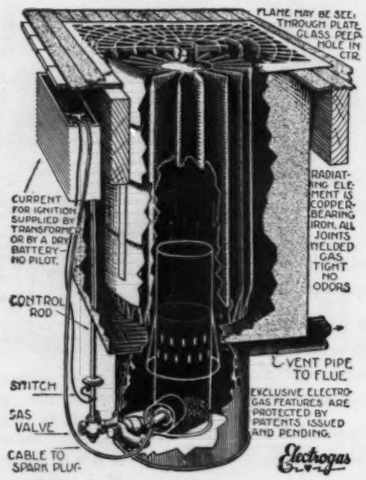
The original electrically ignited furnace.

—

Hollow, streamlined fins offer unusual efficiency.

—

Fool-proof


FLAME MAY BE SEEN THROUGH PLATE GLASS PEEP HOLE IN CTR.
RADIATING ELEMENT IS COPPER-BEARING IRON. ALL JOINTS WELDED GAS TIGHT NO ODORS
CURRENT FOR IGNITION SUPPLIED BY TRANSFORMER OR BY A DRY BATTERY—NO PILOT.
CONTROL ROD
VENT PIPE TO FLUE
SWITCH
GAS VALVE
CABLE TO SPARK PLUG
EXCLUSIVE ELECTRO-GAS FEATURES ARE PROTECTED BY PATENTS ISSUED AND PENDING.
Electrogas

available in four sizes:
20,000 BTU
25,000 „
30,000 „
40,000 „
also in Cabinet type.

Electrogas, now in its tenth year, has won a reputation for efficiency, freedom from servicing, and all-around satisfaction which is second to none. It will pay you to handle this remarkable appliance.

ELECTROGAS FURNACE CO., Rialto Bldg., San Francisco

GAS BURNERS

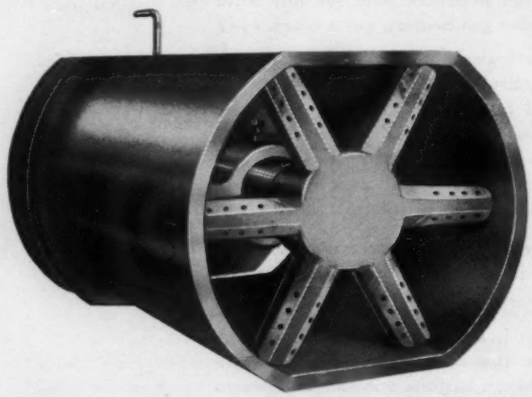
For

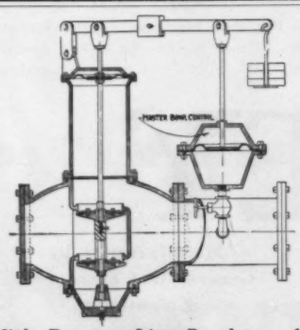
ALL INDUSTRIAL PURPOSES

JOHN ZINK CO.
Oklahoma Natural Gas Bldg.
Phone 4-9838
TULSA, OKLAHOMA

★

Flame Burners
Short Flame Burners
Flameless Burners





High Pressure Line Regulators for reducing pressure from pounds to pounds.

GROBLE REGULATORS & GOVERNORS

Groble Features—

Large Hand Holes
Balanced Valves
Two Piece Valve Stem
Master Bowl Control

Made in sizes from 2 inch to 10 inch.

GROBLE GAS REGULATOR COMPANY, Anderson, Ind.

to prevent scarring cylinders; stuffing boxes should be well and evenly filled with a good grade of packing. Do not screw glands up too tight or the rods and plungers will score. Good metallic packing should be used on steam piston rods where superheated steam is being used. Liquid pistons should be packed with a material that is suitable for the liquid being used.

Edgar G. Hill *is* Vice-Pres. *of* Southern Natural

EDGAR G. HILL, vice-president of Ford, Bacon & Davis, Inc., has been appointed vice-president and general manager of the Southern Natural Gas Corporation, of Birmingham, Alabama, which company has recently brought to completion the construction of a gas line from the Louisiana fields to Birmingham and Atlanta. Announcement of the appointment was made by J. H. White, president of the Southern Natural.

Mr. Hill has been vice-president of Ford, Bacon & Davis, Inc., who designed and constructed the Southern Natural system, for several years past. He has been making his headquarters at Colorado Springs, Colorado, but expects to move his place of residence to Birmingham immediately, according to announcement.

For the past twelve years Mr. Hill has been identified with the natural gas industry as engineer, constructor and executive. A few years after graduation from Yale, he became chief engineer of the Southwestern Gas Company at Independence, Kansas. In 1920, he joined the staff of Ford, Bacon & Davis, Inc. He designed, built and operated, in 1923, a natural gas system for the Northwestern Utilities, Ltd., Edmonton, Alberta, Canada, and became president of that company in 1924. He built and operated the natural gas system for Interstate Natural Gas Company, Inc., in 1926, extending from Monroe, Louisiana, to Baton Rouge, Louisiana, which was at that time the largest natural gas pipe line in America. In 1927, Mr. Hill designed and built the natural gas system of Southern Gas & Fuel Company, extending from Baton Rouge, Louisiana, to New Orleans, Louisiana, acting as general manager of both these companies until January 1, 1928. Leaving these companies at that time, he built and put into operation the natural gas transmission system from Amarillo, Texas, to Denver, Colorado, a system 375 miles in length, transporting natural gas from the great Amarillo gas fields to Pueblo and Denver, Colorado. At that time, this system was the largest and longest natural gas system yet built. He acted as general manager of these properties as a representative of Ford, Bacon & Davis, Inc., until he was appointed vice-president and general manager of Southern Natural Gas Corporation, with headquarters in Birmingham, the latter company taking rank as having built and now operating the longest and largest transmission system yet developed in the natural gas industry.

MISSOURI-KANSAS PIPE LINE CO. NAMES NEW DIRECTORS

Missouri-Kansas Pipe Line Company announces the election of Francis I. du Pont to its board of directors. Other directors include Frank P. Parish, president of the company; B. R. Bay, vice-president and general manager; S. J. Maddin, C. S. Shippey and Ralph G. Crandall, who are vice-presidents; C. A. Meyer, Ralph B. Mayo and W. T. Stevenson. The latter is secretary and treasurer of the company.

Dominant in a Day

The New ROPER

GAS FURNACES

A new, beautiful and thoroughly modern gas fired warm air furnace is winning instant approval over the entire country.

It is a Roper product,—the result of years of furnace manufacturing experience and a thorough study of house heating problems.

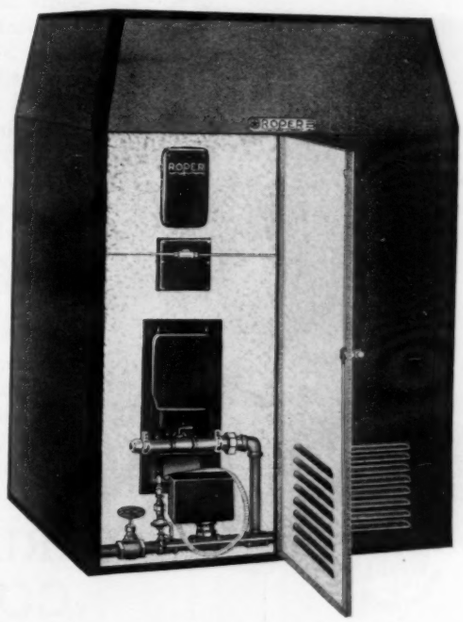
Made in all sizes on the single unit to a battery plan, it is adaptable to every size of job, from a small residence to a large building.

The Roper gas furnace is safe, an automatic heat limit control shutting off the heat at a predetermined temperature.

It can be furnished with or without thermostatic or push-button control, automatic humidifier, safey pilot, limit control and fan.

It is of heavy cast iron construction, and AGA approved.

In short, the new Roper is a product that the Gas Industry can unreservedly recommend.



SPECIFICATIONS

Roper Furnace	Net Available B.t.u. per Hr. at Bonnet	Free Area Through Furnace (Sq. In.)	Input Rating (B.t.u.'s per Hr.)	Number Burners	Flue Vent Sizes (Diam., In.)	Dimensions—Inches Width	Depth	Height
4,000-A	57,500	565	75,000	1	5	22	*44¼	64¾
4,000-B	115,000	1,022	150,000	2	6	44	*40¼	64¾
4,000-C	172,500	1,533	225,000	3	7	66	*40¼	64¾
4,000-D	230,000	2,044	300,000	4	8	88	*40¼	64¾
4,000-E	287,500	2,555	375,000	5	9	110	*40¼	64¾
4,000-F	345,000	3,066	450,000	6	10	132	*40¼	64¾

*Down Draft Diverter adds 18 inches to depth.

Roper Furnaces 4,000-A, 4,000-B, 4,000-C, 4,000-D, 4,000-E, 4,000-F are fitted for manual control,—regularly equipped with main shut off valve and Bunsen flame pilot. These furnaces can also be furnished with thermostatic or push button control, automatic humidifier, safety pilot, limit control and fan. Finished in either plain galvanized and black or Crystal green and black.

GEORGE D. ROPER CORPORATION, ROCKFORD, ILLINOIS

C. B. Babcock Company
135 Bluxome Street
San Francisco

Make Gas the Major Home-Heating Fuel with Wards . . .

IN territories where the Ward Floor Furnace has been established, gas has become a **major,** not simply an incidental, home-heating fuel.

Ward economy and efficiency; Ward simplicity and dependableness; the wholesome healthfulness of Ward heat, have accounted for this. **Ward has become a real load-builder for gas.**

Ward is easy to sell. The cost is moderate; it carries a 10-year guarantee; the value built into it is obvious. Ward is easy to install and service. One man will install a Ward complete in four hours; in Los Angeles county a single service man cares for 50,000 Wards.

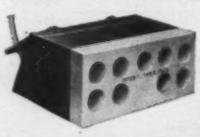
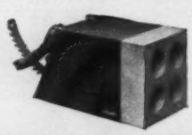
Ward is safe to sell. It is A.G.A. tested and approved . . . tested and approved in the laboratory of actual service; 250,000 Wards have been in use upwards of fifteen years, under every conceivable condition of climate and gas supply.

Every home is a prospect, the old as well as the new. And a Ward in the home makes that home a load-builder and a good will-builder for gas. Write for literature . . . the complete Ward set-up. You will find it most convincing.

WARD HEATER COMPANY

(Operating in Southern California and throughout the nation for the last fifteen years.)

1243 South Hope Street
Los Angeles, California

Mettler Entrained Combustion Gas Burners

FOR ALL Purposes
Kinds of gas
Pressures

406 S. Main St. **LEE B. METTLER. CO.** Los Angeles Cal.

New Home *for* Houston Gas and Fuel Co.

PLANS for a new home for Houston Gas and Fuel Company, distributing subsidiary of United Gas Company at Houston, Texas, have been prepared by Robert C. Smallwood, Houston architect. The accompanying picture is reproduced from the architect's drawing of the proposed building done by Clare C. Hosmer, now associated with Mr. Smallwood.

The building, as planned, will be 102 by 125 feet. It will be erected with reinforced concrete faced with brick and terra cotta. While the present plan calls for a building eight stories with a basement, the foundations have been designed to support four additional stories if desired. Houston Gas and Fuel Company will occupy the first two floors, and the United Gas Company and other Moody-Seagraves interests will occupy the remaining floors.

MINNEAPOLIS GAS LIGHT CO. TO HAVE NEW QUARTERS

The Minneapolis Gas Light Company, with headquarters in Minneapolis, Minnesota, expects to move into new quarters immediately. The building in which offices are to be established will be known as The Gas Building, and is located at Hennepin Avenue and Eighth Street.

Plans are being made for a 1930 program for better gas service for the city as soon as a new rate structure, now under advisement, is approved, according to John K. Swanson, vice-president and general manager of the company.

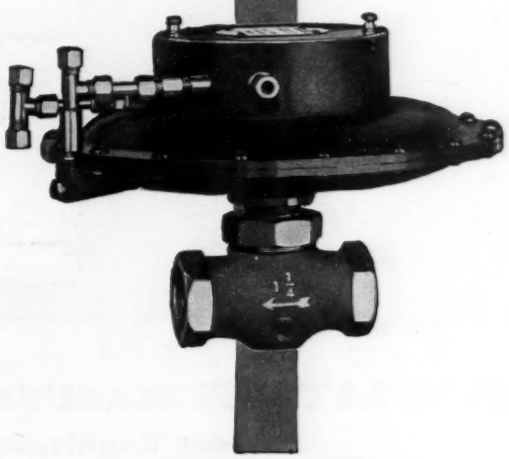
PUBLIC AUCTION WILL DISPOSE OF HELIUM PLANT MATERIALS

Surplus materials left after the dismantling of the United States helium production plant at Fort Worth, Texas, will be sold at the plant at public auction, according to announcement of the United States Government. The Fort Worth plant has been replaced by another plant constructed at Soncy, Texas, near Amarillo.

GLASKIN AND ORR GET LEAVE OF ABSENCE FOR SPECIAL WORK

R. G. V. Glaskin and William F. Orr, sales supervisors of the Kansas City Gas Company, have each been given, beginning January 6, 90-day leave of absence to do special work in the Oil Division of the Cities Service Company in Toledo, Ohio.

This Electric DIAPHRAGM VALVE gives Dependable Service



The 610 Electric Diaphragm Gas Valve —
a sturdy, dependable, automatic control for all domestic and industrial gas-fired equipment.

In conjunction with a room thermostat the 610 Electric Diaphragm Gas Valve gives accurate, *dependable* control of all gas-fired equipment — domestic and industrial heating plants, unit heaters, and industrial ovens.

It is operated from gas pressure built up under the leather diaphragm. Its special features include a leather diaphragm specially treated to resist impurities in the gas—a gas tight seat—elimination of small leak ports — ability to operate on low gas pressure. Because of its precise, rugged construction it operates dependably over long periods of time.

The 610 Valve operates on 100 V. 60 C. A. C. current with a 20 volt secondary transformer which is outside the case. Other models operating on different cycles and voltages are available. It can be operated manually in case of interruption of power. Used in conjunction with gas-type limit controls it gives automatic control even during electric power failure.

The 610 Electric Gas Valve is an important part of Time-O-Stat's extensive line of automatic controls . . . All have been perfected in Time-O-Stat's research laboratories. Together they form the most complete line of controls in the gas industry. For full information on these products, or on any problems of automatic control — write the Time-O-Stat Controls Company.

TIME-O-STAT CONTROLS COMPANY

ELKHART, INDIANA

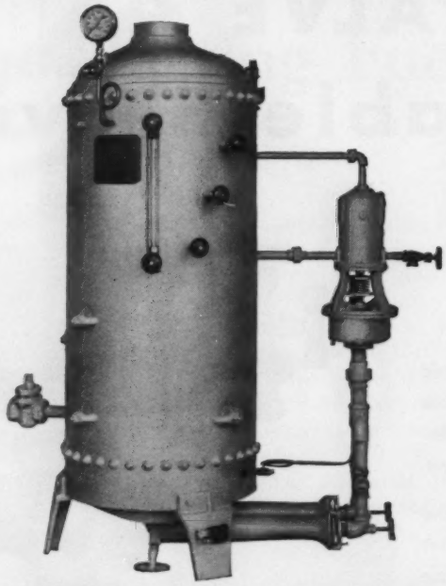
Successor to:
Leachwood Company — *Time-O-Stat Corporation*
Absolute Con-Tac-Tor Corporation — *Cramblet Engineering Corporation*

TIME-O-STAT AUTOMATIC CONTROLS

Manufacturers of AUTOMATIC CONTROLS *for Oil Burners — Gas Burners — Coal Burners — Electric Refrigerators — Furnace Fans — Mechanical Stokers — Industrial Ovens — Ice Machines — Unit Heaters . . . . . also of Sign Flashers — Mercury Switches — Electric Heaters — Corrugated Metal Bellows.*

Automatic Gas Fired Boilers

LATTNER



All Sizes from ½ to 30 H. P.

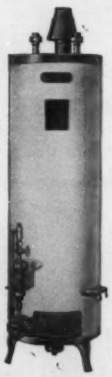
P. M. LATTNER MANUFACTURING CO.

Cedar Rapids, Iowa

A Heater that Will Deliver a Gallon of Hot Water for Every *1 Foot of Natural Gas.*

THE heater is finished in lustrous enamel.

300-lb. test copper-bearing Steel tank.



New Efficient Insulating Material.

Safety Pilot.

Combination Safety and drain valve.

2 sizes: 25 gal.—40 gal.

Pittsburg Monarch Automatic Storage Water Heater

Made in 2 Sizes
25 Gallons—40 Gallons

Pittsburg Water Heater Company

Offices at:

478 Sutter St. San Francisco

2010 Jackson St. Dallas

242 So. Western Ave. Los Angeles

WEST TEXAS GAS CO. MOVES TO NEW HEADQUARTERS

Headquarters of the West Texas Gas Company will be moved from Amarillo to Lubbock, Texas, according to announcement, upon the completion of an office building being constructed by the company at the latter place. The South Plains Pipe Line Company, an affiliated company, will share the building with the West Texas Gas Company. R. F. Hinchey is vice-president and general manager of the latter company, which supplies gas to approximately 30 towns in West Texas.

W. E. HOPPER RESIGNS POST WITH ARKANSAS NATURAL

Walter E. Hopper, formerly associated with the Arkansas Natural Gas Corporation at Shreveport, is now devoting all of his efforts to the Southern States Company, Inc., of which he is president. The Southern States Company was organized at Shreveport two years ago by H. C. Otis and Mr. Hopper, and specializes in the tubing of oil and gas wells against pressure.

MOODY-SEAGRAVES ENTERS INTO OMAHA FRANCHISE ACTIVITY

Press reports from Omaha, Nebraska, announce the entrance of Moody-Seagraves interests into the group seeking to bring natural gas to Omaha. The report states that D. B. Cogswell of Houston and W. G. von Gemmingen of New York, representing these interests, have called on the directors of the utilities district of Omaha with reference to their plans.

ELECTROLUX REFRIGERATOR SALES, INC., IS NEW NAME

Announcement was made early in January of the change in the corporate name of the distributing organization for Electrolux gas-fired refrigerators to Electrolux Refrigerator Sales, Inc., with general offices at Evansville, Indiana. The corporate name of Servel Sales, Inc., will be continued by the organization distributing the compression type of refrigerators.

CAPRON RESIGNS POST WITH U. S. PIPE AND FOUNDRY

J. D. Capron, for many years publicity manager of the United States Pipe and Foundry Company, Burlington, New Jersey, resigned, effective December 31, 1929, to become general manager of the Glamorgan Pipe and Foundry Company, Lynchburg, Virginia. Mr. Capron is succeeded as publicity manager by S. E. Linderman.

MISSOURI INDUSTRIAL GAS CO. TO CONSTRUCT FOUR MAINS

The Missouri Industrial Gas Company of St. Louis, a subsidiary of the Utilities Power and Light Corporation, parent company of the Laclede Gas Light Company, in December was granted permission by the board of Public Service to construct four gas mains through which gas will be distributed to a number of industrial consumers, from the recently completed gas line extending from Louisiana to St. Louis.

NASHVILLE, ARK., RECEIVES GAS FROM LOUISIANA-ARK. LINE

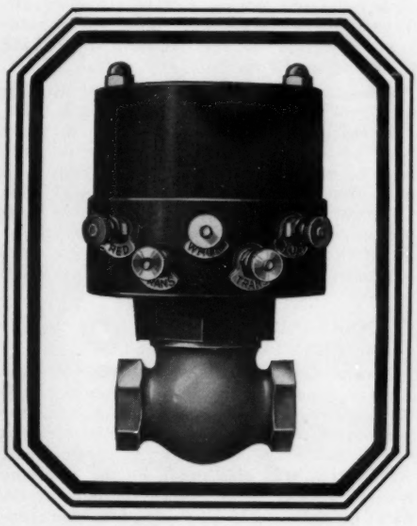
Nashville, Arkansas, is now receiving natural gas through a line constructed by the Arkansas Natural Gas Corporation from its Emmett station on the Louisiana-Arkansas line extending from Shreveport to Little Rock. The Nashville line also serves Okay, Arkansas.

ELECTRIC MOTOR DRIVE . . .

keynote of the Teeple Electric Gas Valve

THE Teeple *Motor Driven* Electric Gas Valve gives to the industry a means of automatic gas control unequalled in sureness, simplicity and value. Smooth and positive in operation, it does its work quietly, dependably. No surge of power strains the transformer—no excess current burns thermostat contacts—yet an amazing ability for hard work keeps the sturdy Teeple motor revolving under conditions too severe for other types.

It does not matter how far away the thermostat is located from the valve. Fifty feet or ten times that distance makes no difference with the Teeple valve. If voltage is low, or gas pressure high, the valve continues to operate unaffected. There is ample power to meet such conditions. That is why service calls are rare and satisfied users numerous.



The Teeple Motor Driven Electric Gas Valve is made in three sizes: ½ inch, ¾ inch and 1 inch. The passage of gas through the valve is not restricted. All sizes are standard and open to full capacity.

. . . Seldom is it necessary to mount transformers when installing the Teeple Electric Gas Valve. Any bell-ringing transformer will do, and one will be found already installed in nearly every home.

Think what a saving this means, with no transformer to buy or electrician's service to pay for. The valve may be wired by any plumber or furnace man—it is only necessary to connect three plainly marked terminals to the thermostat, two others to the transformer.

Write for the whole story of the Teeple Electric Gas Valve. Full information and prices will be sent on request. L. R. Teeple Company, 540 East 9th Street, Portland, Oregon.

TEEPLE

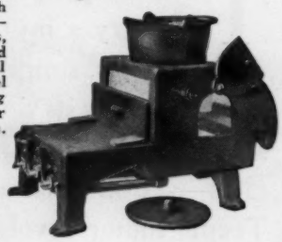
ELECTRIC GAS VALVE

Johnson Torch & Melting Pot

This compact unit serves a number of useful purposes. It performs economically and efficiently for melting soft metals, for heating soldering coppers, and for heat-treating small parts. It may also be used as a hand torch by simply removing the burner. Write for catalog.

An Outstanding JOHNSON Bench Furnace!

This great Johnson No. 118 Combination Bench Furnace holds all records for strength, economy, efficiency, and versatility! It performs many duties with equally high efficiency—heats soldering coppers, melts soft metals, and heat-treats small metal parts and carbon steel tools. Write for catalog describing it — also other Johnson Bench Furnaces.



Johnson Melting Furnaces Built for Service!

The illustration shows the Johnson No. 305 soft-metal melting furnace. Like other Johnson products, its rugged construction fits it to deliver useful service over a long period of years. Three Bunsen burners provide quick, intense heat without blower. Write for catalog giving details of several Johnson Melting Furnaces of various sizes.

JOHNSON GAS APPLIANCE Co.
Cedar Rapids IOWA

Pacific Coast Representative: C. B. Babcock Co.,
135 Bluxome Street, San Francisco

From Coast to Coast for Years Gas Companies Have Sold

Removes Grease

DOUBLE DUTY
REG. U.S. PAT. OFF.

Prevents Rust

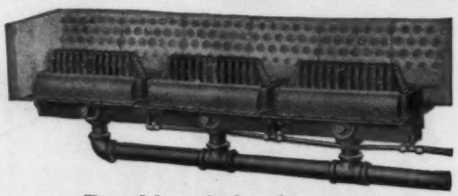
GAS RANGE & STOVE CLEANSER

WALMAR LABORATORY Oshkosh, Wisconsin

Western Distributor

C. B. BABCOCK CO., San Francisco, Los Angeles

R. M. C. Gas Burner



Durable Safe Economical

ROTARY MANUFACTURING CO.

5720 Long Beach Avenue Los Angeles, California

HOUSTON NATURAL GAS CORP. HOSTS TO BANKERS ON TOUR

HOUSTON Natural Gas Corporation, on January 20 and 21, entertained a group of about 30 investment bankers from Baltimore, Boston, St. Louis and New Orleans with an inspection tour of the properties of the Houston Natural Gas Company, and the Gulf Cities Natural Gas Company, Texas Natural Gas Utilities and Tex-Mex Natural Gas Company, its subsidiary companies.

January 20 was spent by the party in visiting points of interest in Houston including a number of industries served by the Houston Natural Gas Company. Among the companies visited were the Hughes Tool Company, Reed Roller Bit Company, Trinity Portland Cement Company, Maxwell House Products Company, Inc. The party also made a trip down the Houston Ship Channel, visiting numerous industries including the Baytown refinery of the Humble Oil & Refining Company. The distribution facilities of the Gulf Cities Natural Gas Company in Goose Creek, Pelly and Baytown were also inspected.

On January 21 the party left Houston for a tour over properties owned by the company in Southwest Texas. This trip included visits to towns served by the Texas Natural Gas Utilities and by the Tex-Mex Natural Gas Company, as well as a visit to gas fields and oil properties controlled by the Houston Oil Company in Southwest Texas. Visits were also made to the Texas Gulf Sulphur Company's plant at New Gulf, Texas, and to the 7,000-horsepower compressor station of the Houston Pipe Line Company at Edna.

Among the banking firms represented in the party were Mackubin, Goodrich & Company of Baltimore and Whitaker & Company of St. Louis, who underwrote the first issue of $2,000,000 six per cent sinking fund gold bonds of the Houston Natural Gas Corporation. The trip was made in connection with a further public offering of $600,000 additional bonds for extensions and additions to the properties of the corporation.

KANSAS PIPE LINE & GAS CO. ASKS PERMIT TO SELL STOCK

Recent application was made by the Kansas Pipe Line & Gas Company, before the public service company of Kansas for permission to issue $1,900,000 of its common stock into 19,000 shares at $100 each. Application was also made by the company to issue $2,500,000 of unsecured notes of the date January 1, 1930, to become due January 1, 1935. Seven per cent interest will be paid on the notes.

CUDNEY IS REPRESENTATIVE FOR COOPER-BESSEMER

J. D. Cudney, formerly manager of oil and gas engine sales for Ingersoll-Rand Company, with headquarters at Dallas, Texas, on January 1 joined the sales force of the Cooper-Bessemer Corporation. Mr. Cudney's new position is that of special sales representative for the Cooper-Bessemer line, with headquarters now at Mt. Vernon, Ohio. He will work on gas and oil engine problems.

SOUTHERN OREGON GAS CORP. TO SPEND $40,000

Southern Oregon Gas Corporation is making plans for an expansion program to cost between $30,000 and $40,000 during 1930, according to K. I. Dazey, general manager for the company at Medford, Oregon.

Welsbach HOTZONE SELF-ACTION GAS WATER HEATER

Member American Gas Association
Member Pacific Gas Association

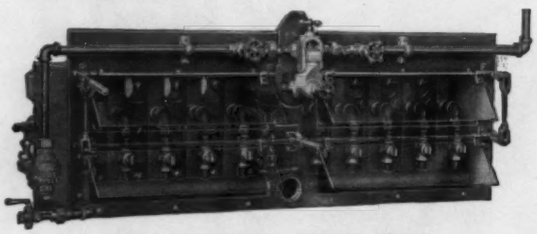
IMPORTANT ANNOUNCEMENT SOON!

50 Hawthorne Street
SAN FRANCISCO, CALIF.

Beauty **The foundation of all beauty treatments depends on cleanliness, and cleanliness calls for Hot Water. Welsbach advertising and Welsbach window displays have been built up on the beauty appeal. Hotzone Water Heater itself has been improved until it is truly a beautiful piece of household equipment. Altogether, the program has resulted in a banner year for Hotzone sales. We thank our many customers for their 1929 support and promise important announcements shortly which will materially increase sales during 1930. Welsbach Company, Gloucester City, New Jersey.**

The Leahy Multi-Jet Unit

Is an investment that will increase operating efficiency and decrease operating cost



Patents allowed and pending
View showing Combination Gas and Oil Unit

Designed for Front, Rear and Vertical Firing, Burning Efficiently Low or High Pressure Natural or Manufactured Gas

Exclusive features that have created exceptional demand for this unit:

1—Designed with no draft loss.
2—High overloads on low gas pressures with minimum draft.
3—Each individual burner receives correct air and gas mixture for maximum efficiency.
4—Auxiliary air opening around tile increases overload capacity of unit with no sacrifice in efficiency.
5—Correct amount of air for combustion can be obtained with minimum opening in stack damper, which retains heat in boiler instead of letting it escape up the stack.
6—Does not require high gas velocities through burner in order to draw sufficient air for combustion.
7—All primary and auxiliary air is admitted through unit and evenly distributed to each burner.
8—Equal distribution of heat full width of firebox.
9—All parts individual and removable.
10—The oil burner can be inserted in the unit or removed instantly.
11—Equal efficiency on gas or oil.

An Efficient, Indestructible, Portable Unit with a Low Initial and Upkeep Cost

Request literature, data, and installation prints on our

Oil and Gas Burning Equipment

LEAHY MANUFACTURING COMPANY

1804-1810 East 8th Street Los Angeles, Calif. Established 1902

IMUNOL

NEW TEEPLE ELECTRIC GAS VALVE ANNOUNCED

The new Teeple Electric Gas Valve was announced in January.

A small squirrel-cage induction motor powers the Teeple gas valve. There are no brushes or commutator, and bearings are so constructed that oiling is not required. The work of operating the valve is extended over a period of several seconds, so that the motor draws little current while operating.

The motor is designed to operate on any bell-ringing transformer, thus eliminating the cost of electrician's services in most installations. It may be located at any distance from the thermostat, up to 800 feet or more. Power is sufficient to squeeze the valve shut, and there is sufficient reserve to handle conditions of voltage and gas pressure encountered in the field. Stalling the valve does not injure motor or transformer.

A simplified scheme of wiring is used, to aid the plumber or furnace man in making the necessary connections in homes where a bell-ringing transformer is already installed, and an electrician is not required.

The Teeple valve is made in the three popular sizes: ½-inch, ¾-inch and 1-inch, and the motor drive permits full lift in each size.

TRADE STANDARDS OF COMPRESSED AIR SOCIETY OFF THE PRESS

The fourth edition of the Trade Standards of the Compressed Air Society has just been published. New material in the pamphlet comprises a formula for use in air compressor testing, this being accurate for higher water columns than the one previously used, thereby extending the capacity of a nozzle of a given size through a greater useful range; further suggestions in connection with the installation and operation of air compressors; caution against the use of old boilers or tanks as air receivers; suggestion for handling very cold "cooling water" so as to prevent condensation and undue wear on the air cylinders; and another illustration of an air cleaning device.

Copies may be had upon application to C. H. Rohrbach, secretary, 90 West Street, New York. The price is 50 cents.

EIGHT NEW OFFICES OPENED IN 1929 BY SO. COUNTIES

Southern Counties Gas Company, with headquarters in Los Angeles, California, has opened eight new offices during 1929 in Southern California towns, bringing the total towns served to 95, with 138,000 gas consumers on the lines. The new offices were opened in the following towns: LaHabra, Rosemead, Arcadia, San Clemente, Brea, Uplands, Baldwin Park, and Azusa.

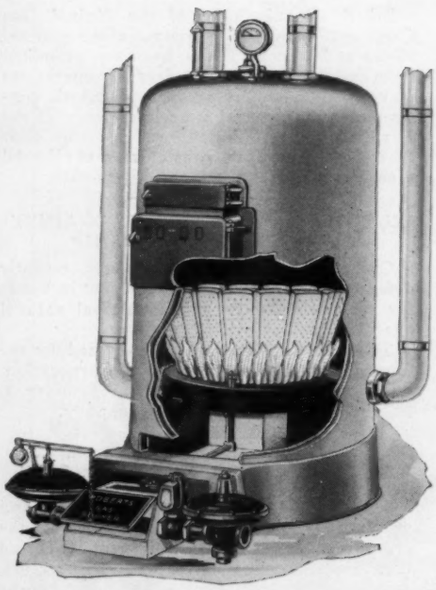
F. G. KUNE RESIGNS POST WITH PITTSBURGH WATER HEATER CO.

F. G. Kune, for a number of years president of the Pittsburgh Water Heater Company of Texas, at Dallas, has resigned his position effective January 1. L. L. Baxter has been placed in charge of the Dallas office of the company.

C. L. WAITE MOVES RESIDENCE TO TULSA, OKLAHOMA

C. L. Waite, who represents the Westcott Valve Company of East St. Louis in Missouri, Kansas and Oklahoma, has recently moved his family and taken up his residence at 1536 South Detroit Street, Tulsa, Oklahoma.

DUPLEX
UNIT CONTROL
GAS HEATING SYSTEM



ROBERTS
CONTROLLED
GAS HEATING UNIT

16,207,000
— 200,000
16,007,000

That represents your market for

HOME HEATING *by* GAS

THE number of domestic consumers of gas in the United States in 1928 totaled approximately 16,000,000. Of that total only 200,000 used gas for home heating.

What an enormous market that leaves yet unsold for home heating by gas! The field has hardly been scratched. These same homes consumed over two trillion cubic feet of gas. Suppose every home consumed gas for fuel—the total would be staggering—beyond human comprehension.

What a big opportunity every gas company has for increasing the gas load in their territory! What a big opportunity for handsome profits thru the sale of Roberts Controlled Gas Heating Units, and Duplex Unit Control Gas Heating Systems. And while the gas company and the gas company salesmen are reaping their profit reward—the home owner is enjoying the benefits of clean, automatic, effortless, healthful and economical heat.

There is certainly a big future for the gas company that will energetically sell the Roberts-Gordon home heating appliances, as many of the country's foremost gas companies are now doing. It would be difficult indeed to find a more fertile field as little exploited—in the entire realm of home appliances.

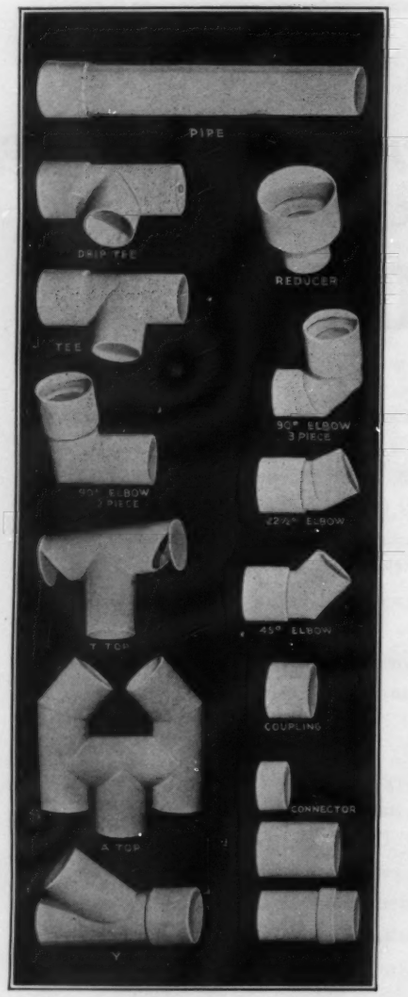
Let us tell you how we help you cultivate the enormous possibilities of the home heating field. Send for complete information—and then decide to cash in on this big opportunity.

ROBERTS-GORDON APPLIANCE CORPORATION

DELAWARE AVENUE AT TUPPER STREET

CURTISS BUILDING BUFFALO, N. Y.

VITEX



Light, Durable, easy to install—this Semi-Vitrified and Non-Corrosive Gas Vent and Flue Pipe is Resistant to Heat, Acid and Water . . .

For Information Write to

Plant Rubber & Asbestos Works

537 Brannan Street San Francisco

Liquified Petroleum Gas has a wide field of usefulness. It is being developed by commercial organizations of known financial strength and vision. This gas is blood brother to the Gas Industry. We should recognize and assist this close relation. Its success will strengthen and fortify our own frontiers.

C. B. BABCOCK CO.

San Francisco Los Angeles

WORTHINGTON PUMP HAS NEW CALIF. ORGANIZATION

On and after January 2, 1930, the interests of the Worthington Pump and Machinery Corporation in the California territory will be served through a local company, the Worthington Machinery Corporation of California, Ltd., with headquarters at Los Angeles and San Francisco.

H. D. Cornell, who has been president of the Worthington Machinery Corporation of Oklahoma, will be president of and direct the new corporation, moving to California for that purpose. George W. Hawkins, who has been director of sales, will also go with the company as vice-president.

The new California organization will take over the sales and engineering staff and the warehouse facilities of the Worthington Company, Incorporated in California, and will hereafter handle all that territory.

STANDARD GAS COMPANY SERVES MADILL AND TISHOMINGO

Standard Gas Company, a property of the Utility Gas Company, with holdings in Kansas and Oklahoma, is now serving gas in Madill and Tishomingo. Gas is being supplied the town from a line of the Oklahoma Natural Gas Corporation extending eastward from Ardmore. This line connects with a line constructed by the Standard Gas Company, 16 miles in length. William J. Holleman of Oklahoma City is president of the Standard company and S. M. Williams, Jr., of Tulsa, is vice-president.

CUNNINGHAM GETS PROMOTION WITH UNITED GAS

Eli R. Cunningham, of the United Gas Company, with headquarters in the general offices at Houston, Texas, has been promoted from assistant superintendent of operations to superintendent of operations, which contemplates the general superintendency of the Dixie Gulf Gas Company and Houston Gulf Gas Company, both subsidiaries of United Gas.

ELK CITY, OKLA., VOTES AGAINST MUNICIPAL OWNERSHIP

Citizens of Elk City, Oklahoma, recently defeated a proposal to vote $190,000 in bonds for the establishment of a municipal natural gas distribution system.

The Elk City gas system is owned by the Central States Power & Light Corporation, which purchased the system on January 1, 1928, from the Brickell Gas Company.

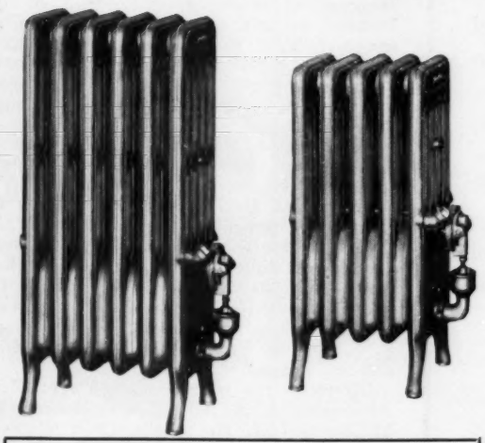
J. E. PEW LEAVES DALLAS, TEX. POST FOR PHILADELPHIA

J. Edgar Pew, prominent in the oil and gas industry at Dallas, and one of the organizers of the Mid-Continent Oil and Gas Association, is moving to Philadelphia, Pa., where he will assume his duties at the general headquarters of Sun Oil Company of which he is vice-president. Mr. Pew has had charge of the Dallas office of the company.

NANCEY DEANE OIL & GAS CO. GETS KANSAS CHARTER

The Kansas charter board in December granted a charter to the Nancey Deane Oil & Gas Company with headquarters at Pittsburg, Kansas. The board of directors of the company which is reported to have extensive gas holdings in the St. Paul, Kansas, field, include Dr. Herbert Smith, F. I. Smith, F. B. Smith, J. G. King and George Malcolm. The company was authorized to issue 1,000 shares of no par stock.

The *New 5-Column* Pacific Gas-Steam Radiators



FIVE COLUMNS, instead of four. Much greater radiation surface. Faster heating. Improved efficiency. Corto design of greater beauty. These improvements, combined with previous advantages, make Pacific Gas-Steam Radiators an outstanding achievement.

Each radiator a complete, self-contained heating unit. No central boiler plant, no steam pipes, no return pipes required—only a gas connection. Generates its own steam. Heat, steam-pressure, and gas consumption automatically controlled.

Write for full details of this profitable, easy-to-sell line.

A Complete Line of Gas-Heating Appliances

By Oldest, Largest Gas-Heating Organization in the West

PACIFIC GAS RADIATOR CO. is a group of gas-heating engineers manufacturing and guaranteeing every type of gas-heating appliance, as shown by the cuts at the bottom of this page. If you are interested in one or a dozen kinds of heaters, Pacific Gas can serve you.

Write for Valuable Agency Proposal

We have a worth-while story to tell any firm interested in selling more and better gas-heating appliances. Write today for complete details.

Outstanding Features

***Scientific Design*—Radiator sections and combustion chamber a single-unit casting. Burner extends full length of radiator, under exact center of water chamber, developing maximum steam in minimum time. Burner cast in one piece, without joints or welds.**

***Automatic Operation*—Flow of gas positively controlled by regulator of double-disc diaphragm type, automatically keeping steam pressure uniform.**

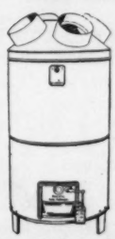
***Adaptability*—Pacific Gas-Steam Radiators designed in different heights and number of sections to meet every steam heating need.**

***A.G.A. Approval*—Laboratory seal of American Gas Association guarantees that every Pacific Gas appliance meets basic national safety requirements. Also approved by Underwriters' Laboratory.**

Pacific Gas Radiator Gas Heating Company Headquarters

Roseberry and Walter Streets
Huntington Park California

Gas-Steam Radiators

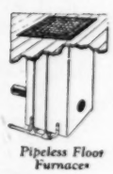

Round Furnaces

Dual Pipeless Furnaces

Fireplace Radiant Heaters

Recess Radiant Wall Heaters

Automatic Storage Hot Water Heaters

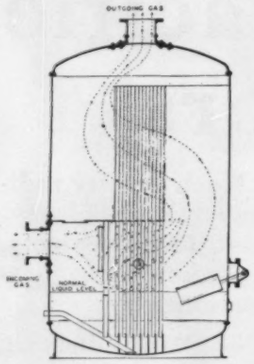

Pipeless Floor Furnaces

Gas Radiators—Pressed Metal and Cast Iron

Agencies Throughout the West

Call for a Pacific Heating Engineer

MANUFACTURERS *of* EVERY TYPE *of* GAS HEATING APPLIANCE



A KNOCKOUT
Figuratively and Literally *The* MIST-D-FIER

IT'S A GAS and oil separator, and when we say **Separator,** we mean SEPARATOR.

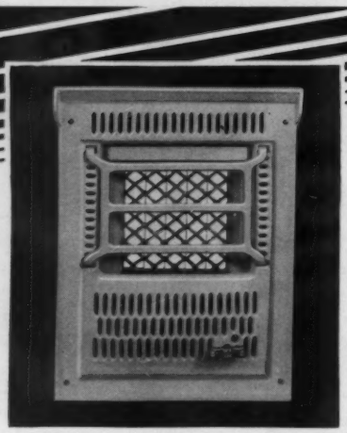
Whatever you want separated (be it oil, gasoline, or other mist) from gas, steam, or air—there's a type of MIST-D-FIER that'll do the job.

Meet our working model at the Oil Equipment & Engineering Exposition, Shrine Auditorium, Los Angeles, March 16-23, Booth 401, outside.

In the meantime send for Bulletin No. 6.

J. A. CAMPBELL CO.
Natural Gas Engineers
CONSULTING PHONE-416-93
DESIGNING P.O. DRAWER 669
CONSTRUCTING LONG BEACH, CAL.

STEARNS-ROGER MFG. CO., DENVER
MID-CONTINENT AGENCY



Bathroom Heaters

Finishes: Cordeveaux or White or Colored Enamel

ILLUSTRATED is Guardian Model 5X. A built-in type heater for bathrooms and other small rooms. 5 elements. Retail price, $25.

A portable bath or sunroom heater is available in 5 elements size at $12.50 list.

THE GUARDIAN GAS APPLIANCE CO.
1364 East 47th Street, Cleveland, O.

Ask for catalog of complete Guardian line—illustrated in full colors—prices, discounts, etc.

in the Cordeveaux finish

Guardian
FIREPLACE AND PORTABLE HEATERS

New Officers Elected *for* Petroleum Exposition

AT a meeting in Tulsa on January 14, directors of the International Petroleum Exposition and Congress re-elected W. G. Skelly as president, Frank Hinderliter as first vice-president, Alf G. Heggem, as second vice-president, A. W. Leonard as treasurer, William Holden as secretary and Victor Shenk as assistant secretary. William B. Way, general manager of the Exposition during the past year, had previously been appointed to manage the exposition the coming year.

The above officials with the exception of the assistant secretary were elected to the executive committee, as were also O. T. Dawson and D. D. Wertzberger. A. W. Leonard is chairman of this committee.

New directors elected are M. F. Waters, Wirt Franklin, W. S. Fitzpatrick, Roy Jones, F. D. Bostwick, S. A. Guiberson, Jr., W. S. Farish, E. R. Brown, P. M. Miskell, F. B. Parriott, E. J. Sadler, E. J. Bullock, R. C. Holmes, Ernest Cornelius, T. B. Slick and Al Peake.

Directors who were re-elected are: Clyde Alexander, A. A. Beard, A. F. Bourne, W. M. Bovaird, J. H. Brooks, O. T Dawson R. E. Day, C. P. Dimit, Ray L. Dudley, George A. Dye, John M. Egan, J. P. Flanagan, H. V. Foster, Jacob France, Robert F. Garland, J. Burr Gibbons, Walter Gray, Henry Greis, R. A. Griffith, Brooks Gutelius, P. D. Hayes, J. M. Hayner, Alf G. Heggem, Frank Hinderliter, William Holden, B. E. Horrigan, Fred Insull, A. W. Leonard, Joe McGraw, D. F. McMahon, Walter Miller, Ernest Nicklos, Clyde Pape, J. Edgar Pew, Waite Phillips, Warren C. Platt, Ralph Pringle, Harry H. Rogers, R. C. Sharp, J. S. Sidwell, W. G. Skelly, Harry H. Smith, Victor H. Smith, O. C. Staples, D. D. Wertzberger, R .M. Young, J. H. Satterwhite, W. A. Schlueter, Frank R. Billingslea, T. R. Weymouth, E. B. Reeser and Harry J. Morlang.

It was recommended by the directors that the proposed marketers' and refiners' exhibit building be made ready for the 1930 exposition to be held October 4 to 11. The building is 60 by 240 feet in dimensions.

GAS SERVICE CO. TRANSFERS DISTRIBUTION SYSTEMS

The Missouri Public Service Commission has approved the application of the Gas Service Company of Kansas City for permission to transfer distribution systems in Neosho, Billings, Monett, Marionville, Pierce City, Republic, Aurora and Forest Park, to the Ozark Distributing Company, a recently organized subsidiary. These southwestern Missouri towns are on the line recently constructed by the Doherty interests to Springfield. Two of the cities, Pierce City and Marionville, have already been piped for gas and work is being rushed to completion in the other cities.

CITIES SERVICE NET EARNINGS FOR 1929, $43,452,386

Cities Service Company has announced its net earnings for 1929 as $43,452,386, which is a 29 per cent increase over the 1928 total, and a new high record for the company. Amount earned on each share of common stock was $1.18, as compared to $1.14 for the 12 months ending November 30, 1928. Announcement was also made of the fact that the company spent more than $100,000,000 for construction and acquisitions in 1929 and that a similar program amounting to $150,000,000 will be carried out during 1930.

THE Erickson TEL-O-STAT

Illustration is two-thirds actual size.

14 Points of Superiority

OF THE ERICKSON GAS-O-TROL

1. It has all metal seat construction.
2. Is rust proof, gas-resisting, and non-corrosive.
3. No overheating the home—provides uniform, healthful temperature.
4. No guessing at temperature—no forgetting to remember.
5. It may be operated with Tel-o-stat, push button or Thermostat.
6. It is fully protected by broad, fundamental patents.
7. It is small, simple, and compact.
8. Is leakless, packless, and noiseless.
9. It is backed by an unconditional guarantee.
10. The watch dog of your gas meter.
11. It is self-cleaning and snap-acting.
12. Is neat and durable—will last indefinitely.
13. It is a means to economy.
14. It has a multitude of applications, public, domestic and industrial.

THE Erickson GAS-O-TROL

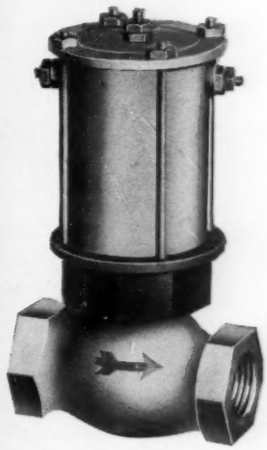


Illustration is one-half actual size of 3/8-inch valve.

This Control Makes Gas the Ideal Fuel

GAS has long been recognized as the ideal quick-acting heat and for years has been used extensively for cooking and for industrial purposes where there was an operator constantly on watch. With the aid of scientific instruments for controlling the regulation of gas, it is becoming recognized as the most efficient fuel obtainable for all purposes.

The Erickson Gas-o-trol is a simple electrically-operated gas valve controlled by an Erickson Tel-o-stat placed at a remote point. It provides a positive control of the gas flow and thus makes it possible to use gas for heating with perfect safety and the greatest economy. The Erickson Gas-o-trol is made in sizes that fit most any requirement. The 3/8-inch size passes 100 feet of gas per hour, the 1/2-inch size passes 150 feet, and the 3/4-inch size passes 250 feet. It is also made in larger sizes to accommodate any required capacity.

The Erickson Tel-o-stat is the latest development in a moderately priced room thermostat. Placed wherever desired in the home, it actuates the Erickson Gas-o-trol on the furnace. Besides being of an attractive design, the Erickson Tel-o-stat features a signal light which tells when the furnace is burning. It is also equipped with a complete cut-off switch for use at night or during prolonged absence. The indicator is set for any desired degree of temperature and the Gas-o-trol maintains this temperature uniformly by turning the flow of gas off and on as the temperature in the home rises or falls, resulting in a substantial saving of gas.

We are Pacific Coast distributors for

The "MINNEAPOLIS" HEAT REGULATOR

ARTHUR F. ERICKSON COMPANY

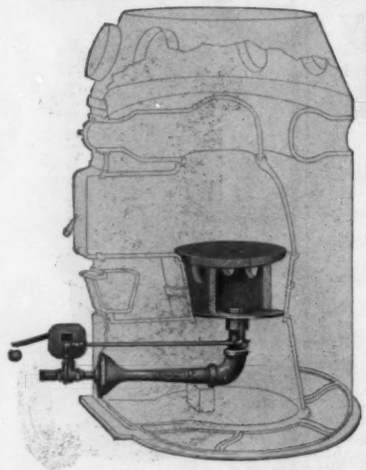
557 Market Street
SAN FRANCISCO, CAL.

Selling Building
PORTLAND, OREGON

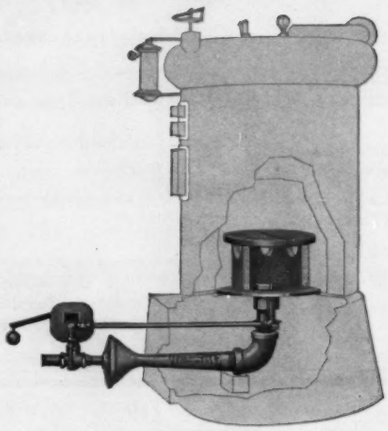
Terminal Sales Building
SEATTLE, WASH.

MAXON

Conversion Gas Burners



The above is an application to a warm air furnace. The burner is easily installed and the unit is fool-proof, making it a very dependable conversion unit for gas companies to recommend and sell.



This is an application to a round boiler. The burner is equipped with a snap-acting valve which can be attached to the existing furnace chain and manually controlled from upstairs. Either automatic or hand-controlled is recommended.

Pacific Coast Representative

The T. G. ARROWSMITH CO.

661 Howard St.

San Francisco, Calif.

MAXON PREMIX BURNER CO.

INDUSTRIAL FUEL BURNING EQUIPMENT — FOR OIL OR GAS, OR BOTH COMBINED

MUNCIE — MAXON PREMIX BURNER — INDIANA

Reynolds Gas Control Since 1892

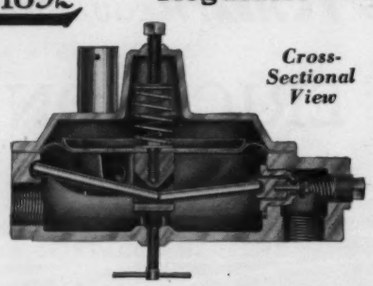
Reynolds Little Giant Regulator

Products for all kinds of Pressure Reduction—for either artificial or natural gas.

GOVERNORS—Intermediate Pressure, Triple Outlet, Holder, Toggle Type Street.

REGULATORS—High Pressure Service, Low Pressure Service, High Pressure Line, Single and Double District Station.

VALVE—Automatic Quick Closing Anti Vacuum.



Cross-Sectional View

Reynolds Gas Regulator Company

Anderson, Indiana

CENTRAL STATES P. & L. BUYS MORE GAS PROPERTIES

E. H. Poe of Tulsa, southwest district manager of the Central States Power & Light Corporation, has announced the purchase by his company of the gas supply lines and distribution systems of the Western Counties Gas Company. The company will continue to be operated under its present name. Another company included in the purchase is the Urbana Oil Company, a producing company of western Oklahoma.

Gas is distributed by the Western Counties Gas Company at Bessie, Clinton, Cordell, Dill City, Hobart, Lone Wolf, Rocky and Sentinel in Oklahoma. The Central States Power & Light Corporation owns supply lines feeding from the Sayre and Texas Panhandle fields and supplies gas in 19 towns in northern and eastern sections of Oklahoma and in Elk City and Erick in western Oklahoma. The company also owns electric properties supplying service in Oklahoma to Allen, Atwood, Calvin and Stonewall.

STELLER NAMED ADVERTISING MANAGER FOR McEVERLAST

McEverlast, Inc., of Los Angeles, California, manufacturer and distributor of protective coatings for all types of engineering structures, announce the addition of O. A. Steller to the headquarters staff at 111 West Seventh Street, Los Angeles.

Mr. Steller, who has been appointed to the position of manager of the advertising department of McEverlast, Inc., comes to his new duties with a background of engineering, technical advertising and editorial experience. He has for several years past been editor of the magazine "Concrete."

AUBURN, WASH., MAY GET GAS SERVICE SOON

According to a recent report by the Washington Gas and Electric Company, over 200 applications have been made for gas service in the city of Auburn, Washington. A survey is being made of the city to determine whether or not the company shall serve the town. Gas company officials state, according to Ray Alexander, who is in charge of the work at Auburn, that the quota has almost been reached, and that gas service is practically assured to the city.

ENGINEERS APPOINTED TO LOOK INTO ALBUQUERQUE FRANCHISE

The appointment of Black & Veatch, engineers of Kansas City, Missouri, has been announced by the City of Albuquerque, New Mexico, to investigate and make recommendations regarding the applications of five gas companies for permits to serve natural gas in that city.

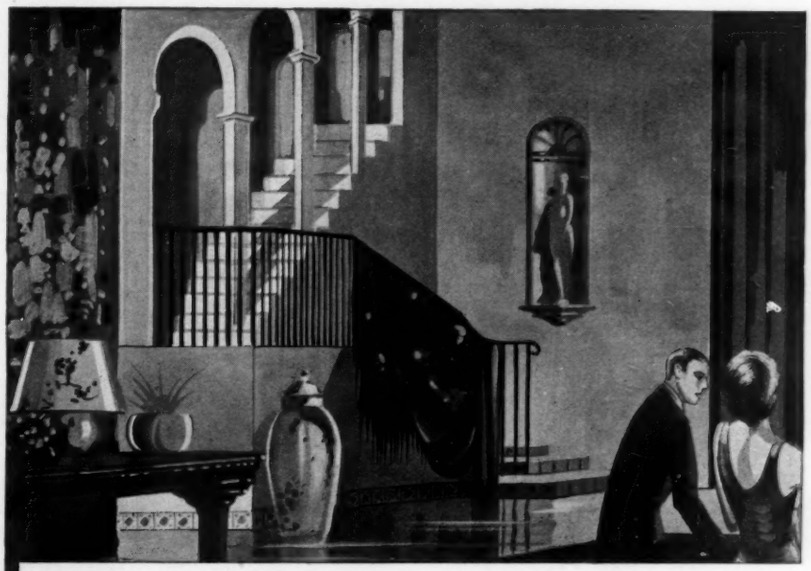
MONTANA UTILITIES CORP. GETS CANADIAN FRANCHISES

The Montana Utilities Corporation, through its vice-president T. P. Jones, recently announced the securing of franchises for the service of natural gas in Moosejaw and Regina, Saskatchewan, in Canada, the gas to be supplied from the Bowes structure south of Chinook, Montana.

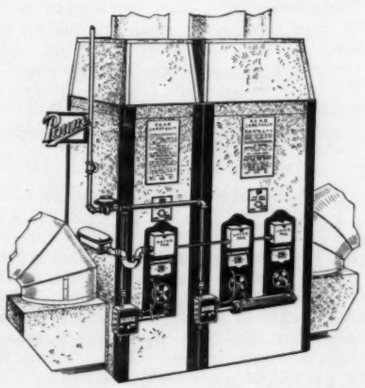
WYOMING GAS PRODUCTION MAKES RECORD IN 1929

A new record was established in 1929 by the state of Wyoming for gas production with a total of 56,664,383,000 cubic feet of gas, valued at $2,266,575.52, as compared with 47,356,306,000 cubic feet valued at $1,890,252 in 1928.

In the Homes of Hollywood Screen Stars

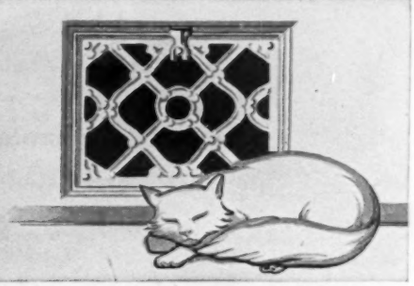


YOU, too, may now enjoy "Gas Heating at its Best!" Payne Gas Furnaces are built in a variety of types and sizes . . . for every building and climate. Below is shown the Payne Unit System which provides an instant supply of fresh, pure warmed air in any one room, or in any group of two rooms or more —merely by pressing a button or setting a clock! With this system of "heat control", all the waste, inconvenience and hard labor of furnace tending the old fashioned way is eliminated!



ARTISTS, directors, writers . . . nearly all the "big names" you read about . . . live in homes that are heated by Payne Gas Furnaces! In the Hollywood film colony it is just as natural for architect and owner, builder and contractor, to agree on *Payne Heat* as it is for California ranchers to grow oranges. Payne Heat supplies even, healthful, dependable warmth for large or small sized dwellings . . . for offices, stores, factories and public buildings. Payne Gas Furnaces have incorporated discoveries and advancements that insure quicker heating results, greater all-around comfort . . . and a degree of operating economy never before achieved in similar equipment! Write for folder: "Five Ways to Heat Your Home with Gas."

PAYNE GAS FURNACES



Dealers

The Payne Gas Furnace Franchise for your town may be open. Write today for new Catalog and Proposition!

PAYNE FURNACE & SUPPLY CO., Inc.

Beverly Hills, California

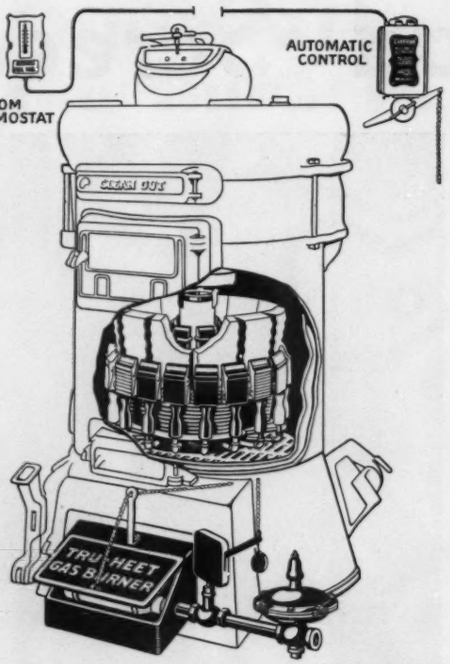
There is a "Payne Heat" System for Every Building and Climate!

Payne Heat

Factory Units
Unit Furnaces
Floor Furnaces
Central Furnaces
Pipeless Wall Units
Industrial Installations

NOW The New Improved

Gas Conversion Burner with Safety Pilot



The **TRU-HEET Automatic Conversion Burner Unit** is equipped with an Automatic Safety Pilot, Automatic Room Temperature Regulator, Automatic Air-intake, Snap-Valve and Gas Regulator.

Quickly and easily installed in all types of hot water, vapor and steam heating boilers and warm air furnaces. Placed right on the grate bars without dismantling the furnace.

There is a big market for an efficient gas conversion burner.

Write for attractive net prices

TROOP WATER HEATER COMPANY

2516-26 Jane Street
Pittsburgh, Pa.

Here It Is!

The Natural Gasoline Association has adopted as a standard

THE AC-ME GAS GRAVITY BALANCE

with the four spring suspension recommended by the Bureau of Standards.

Write for detailed description.

Our complete line of Specialties are listed in Bulletin No. 14

Write for your copy

The Refinery Supply Company

621 E. Fourth St.
Tulsa, Okla.

3404 Main St.
Dallas, Tex.

20 MISSOURI AND ARKANSAS TOWNS TO HAVE NATURAL

More than 20 cities and towns in Arkansas and Missouri along the route and in close proximity to the carrier line recently completed by the Mississippi River Fuel Corporation from Louisiana to St. Louis, will receive gas from the carrier.

Gas will be distributed at Stuttgart, Warren, Monticello, England, Lonoke and other Arkansas towns in the vicinity by the Arkansas Natural Gas Corporation; at Jonesboro, Searcy, Kensett, Hoxie, Walnut Ridge, Newport and others by the Arkansas Power & Light Corporation; and at Poplar Bluff, Fredericktown, Crystal City, Farmington, Festus and other Missouri towns by the Missouri Natural Gas Company. City distribution systems in many of these towns have already been brought to completion.

ALEC S. FIELD ACCEPTS POST WITH NAYLOR PIPE CO.

Alec S. Field, formerly with the Shell Petroleum Corporation, Dallas, Texas, in charge of the Eastern Division, has resigned his position to go with the Naylor Pipe Company as assistant director of sales.

Mr. Field received his early oil field training with the Standard Oil Company of Louisiana, and was one of the first of the new generation of engineers entering production work.

Mr. Field has been chairman of the Southwestern Division of the Development and Production Engineering of the American Petroleum Institute for the past year and is widely known among this group in the petroleum industry.

ARKANSAS NATURAL TO SERVE WARREN, ARKANSAS

Arkansas Natural Gas Corporation began construction of a city distribution system at Warren, Arkansas, about the middle of December. Gas will be supplied the city through a lateral from the Mississippi River Fuel Corporation line from the Louisiana gas fields. The Arkansas Natural also holds a franchise in Monticello as well as in other towns in the district.

IMUNOL INCREASES PLANT CAPACITY BY 50 PER CENT

According to word recently received by B. W. Mueller, manufacturers representative of San Francisco, California, the Inertol Company has doubled its plant size during 1929. New and modern machinery has also been installed which increases the output capacity considerably. The sales of Imunol, a gas holder preservative made by this company, increased in 1929 to four times the previous year's output.

PUEBLO GAS AND FUEL TO SPEND $200,000

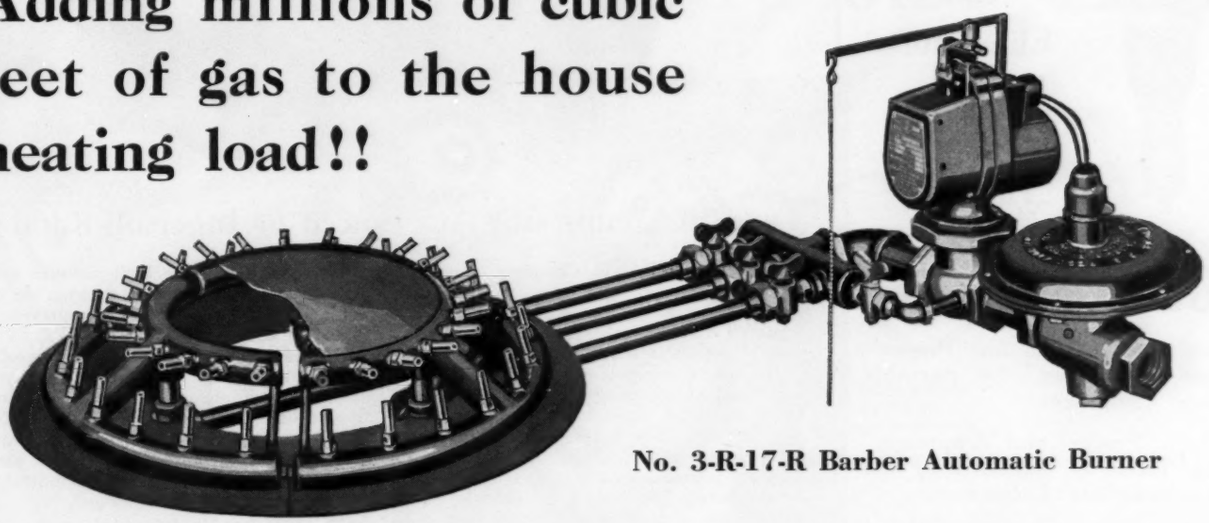
Expenditures of more than $200,000 were made during 1929 by the Pueblo Gas and Fuel Company of Pueblo, Colorado, for extension of service, and for replacements and betterments. A sum of $104,000 has been set aside for extensions during 1930, and the usual replacements will bring up the total expenditures for the year to approximately the same figure as 1929.

PIONEER GAS UTILITIES TO SERVE NEW OKLAHOMA TOWNS

The Pioneer Gas Utilities Company, of which J. A. S. Wright is president, has constructed local distribution plants in McCloud, Harrah, Choctaw, Jones City, Nicoma Park, Spencer and Dale. Gas is to be supplied the cities through a line from the Oklahoma City gas field.

What are BARBER *Automatic* JET GAS BURNERS doing for gas companies?

Adding millions of cubic feet of gas to the house heating load!!

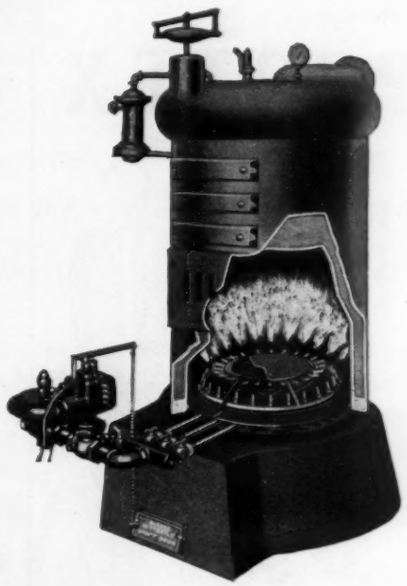


No. 3-R-17-R Barber Automatic Burner

This excellent medium priced Automatic Burner is designed for rapid installation through the Clinker door openings of Round Boilers and Furnaces—without removal of the grate bars. Supplied in four sizes for grate diameters from 16 to 31 inches inclusive. Special assemblies are also supplied for practically every make of furnace or boiler with rectangular firebox.

Only a few of your house heating prospects can afford expensive new heaters to enjoy clean, carefree, automatic gas heat. A majority of prospects can be added to your lines with the Barber Automatic Jet Gas Burner. It converts any good coal-burning furnace or boiler into an efficient gas heater at a low cost.

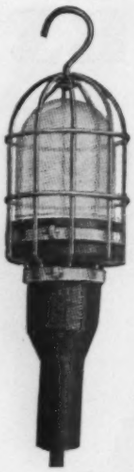
Write today for a supply of specification data sheets so that we may co-operate with you to the greatest degree in specifying and supplying Barber Automatic CONVERSION Burners of the proper capacity, assembled to size for the particular furnace, boiler or appliance in which same is to be installed. This will insure you of our responsibility for the proper operation of the equipment, and reduce to a minimum the installation cost.



Illustrating the No. 3-R-17-R Barber Automatic Burner installed through the clinker door opening of a round boiler.

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

VAPROTEX



A New VAPOR PROOF LAMP That Eliminates Explosion and Shock Hazards

NO. VGH

Gas Companies

are standardizing on "Protex" and "Vaprotex" for portable light equipment.

Both "Protex" and "Vaprotex" are listed as Standard by the Underwriters' Laboratories.

Sold with or without hook or reflector.

PROTEX

The New RUBBER HANDLED LAMP Saves Money and Time Gives Safety Shock Proof

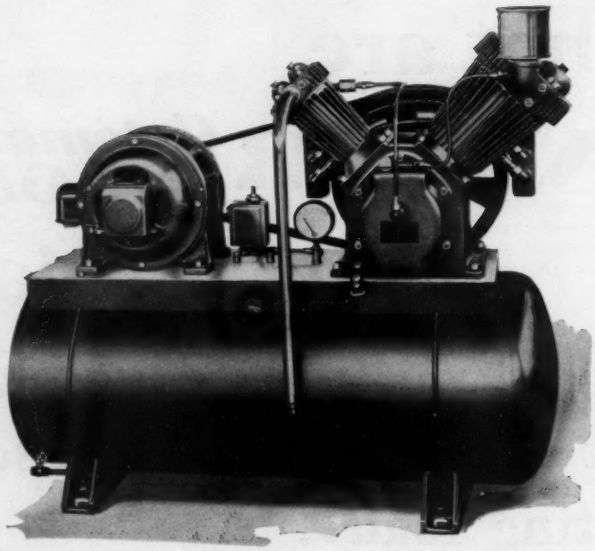
NO. PGHR

Ask Your Dealer

Distributed in the West by

E. A. Key Co., Inc.

2814 Santa Fe Avenue
Los Angeles, Calif.



Type 30 Compressor Announced *by* Ingersoll-Rand Co.

INGERSOLL-RAND Company announces a new line of air-cooled, two-stage air compressors, known as the Type 30. V-type belt drive is employed. Both motor and compressor have ball bearing.

The units are self-contained, the motor and compressor being mounted on a steel base, which is attached to the top of the air receiver. The latter, which is made of heavy pressed steel, is built to withstand a working pressure of 200 pounds. With this arrangement, no special foundation is required for correct alignment of the compressor and motor. The compressor is ready to operate as soon as the electrical connections to the motor have been made and the crankcase filled with oil.

The intercooler is located behind the fan-type flywheel, and a constant current of circulating air is driven directly across the cooling coils. This reduces the temperature of the discharge air.

Automatic start and stop control, furnished as standard equipment, operates independently, but in conjunction with the unloader. When the pressure in the air receiver reaches a point at which the regulator is set to unload, the motor is automatically shut off. A centrifugal governor allows the air in the high-pressure cylinder and intercooler to exhaust through the crankcase. This prevents the compressor from starting against a load.

Honed cylinders and two oil control rings reduce the oil in discharge air to a minimum. Each piston is run into its respective cylinder, insuring a tight oil seal.

The base of the compressor unit forms a reservoir for the oil, and no oil pump is required. A bayonet gauge indicates the amount of oil in the reservoir.

A self-cleaning air cleaner keeps dirt out of the compressor. The compressor is entirely enclosed. It is equipped with balanced crankshaft.

According to the manufacturer, this improved two-stage design reduces power from 10 to 30 per cent, and requires less floor space.

It is built in four sizes: ¾, 1½, 3, and 5 horsepower. All sizes are built for a working pressure up to 200 pounds continuous duty.

A copy of bulletin 3060 describing the Type 30 units may be obtained by addressing the Ingersoll-Rand Company, 11 Broadway, New York.

J. W. GATES NOW MANAGER OF ATLANTA GAS LIGHT CO.

R. C. Hoffman, Jr., vice-president of the Southern Cities Public Service Company, the parent company of the Atlanta Gas Light Company, has announced the appointment of J. W. Gates as manager of the Atlanta company, succeeding M. L. Kane, who recently resigned. Mr. Gates was former eastern division manager of the Southern Cities Public Service Company.

The Atlanta Gas Light Company now has under way in the city a large program of gas main extension which it expects to continue throughout the year. Natural gas is now being supplied the city through the line constructed by the Southern Natural Gas Corporation.

LAS ANIMAS, COLO., RECEIVES NATURAL SERVICE

Las Animas, Colorado, received natural gas late in December through the mains of the Arkansas Valley Natural Gas Company.

PUBLIC SERVICE CORP. OF TEXAS GETS MORE FRANCHISES

Public Service Corporation of Texas, with headquarters at Fort Worth, began the service of gas at Gage, Oklahoma, on January 7, the same day that the citizens voted the company a franchise. On the same date franchises were granted the company at Fargo and Shattuck. The city distribution system at these two places is now being brought to completion.

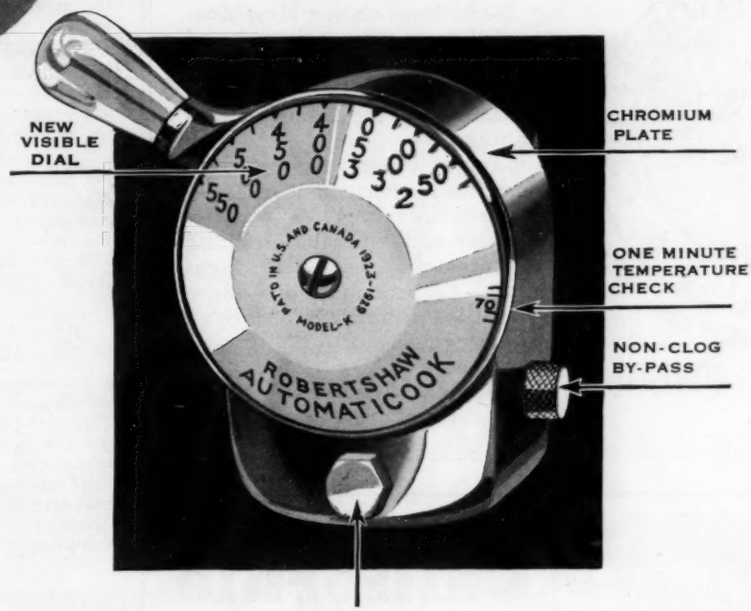
Gas will be supplied the towns from the Wheeler County, Texas, gas fields through a line recently completed by the Public Service Corporation. The line also will supply gas for Perryton, Spearman, and Higgins, in Texas.

WOLF POINT, MONTANA, FRANCHISE ASKED BY PERKINS

Wolf Point, Montana, will receive gas through the mains of the A. H. Perkins interests, if the franchise asked by Mr. Perkins is granted.

5 FEATURES!

make the "K" Type Robertshaw's greatest AutomatiCook



WHEN the new gas ranges reach you, look for the brand new, greatly improved Robertshaw "K" type AutomatiCook. Examine it. You'll find in the new AutomatiCook selling arguments that will make your ranges move faster.

Five new features—smaller, neater, more compact. There's a fully visible dial. There's a handsome chromium finish. There's a fool-proof One-Minute Temperature Check. A non-clog by-pass. And only *one* bolt holds the whole AutomatiCook to the range! Temperature setting, calibrating and all working parts accessible from outside the range.

We've prepared some descriptive literature of this new AutomatiCook. Write for it now. Study it before your ranges begin to arrive . . . . If you'll send us the names of your employees handling, selling or installing ranges, we'll be glad to send them literature to help sell ranges faster, too . . . Write—*today!*

ROBERTSHAW AutomatiCook

ROBERTSHAW THERMOSTAT COMPANY

Youngwood, Penna.

Re-Chrome Meter Leather

Re-Chrome Meter Diaphragm

BESSE, OSBORN & ODELL INC. · COLONIAL BRAND · BOSTON, U.S.A. · RE-CHROME METER LEATHER

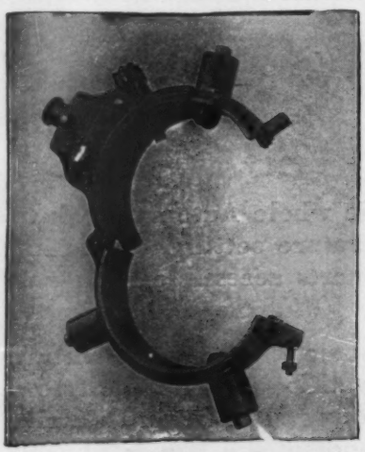
"Colonial" Brand

Made from choice New Zealand Lamb skins selected and tanned with the greatest care. Diaphragms made from this leather have the following advantages:—

Longer years service—More accurate measurement of gas—More impervious to water—Greater resistance to heat and climatic changes — Stronger fibre—Absorbs more oil—More Flexible—Eliminates "floppy" diaphragms.

Besse, Osborn & Odell, Inc.

51 South St., Boston 177 William St., New York



The STRICKLER

Ratchet Pipe Cutter

The STRICKLER Ratchet Pipe Cutter automatically cuts cast iron, steel and wrought iron pipe (from 1½ to 30" in diameter) by hand (either in the trench or in the shop).

You can cut any pipe from any position easily. Simply pump the handle and the STRICKLER does the rest. Order your STRICKLER Now

W. W. STRICKLER & BROS.

1475 Oak Street Columbus, Ohio

California Oxide

GAS Purification Requirements can be most efficiently cared for through the additional and improved facilities of our new plant in Southgate.

Both Maas and McKee Oxides have met gas purification requirements of the Pacific Coast over a period of several years and merit your investigation.

California Oxide Co.

308 East Eighth Street

Los Angeles

TRinity 0769

Relic Unearthed *by* Coast Counties Workmen

EXCAVATORS laying the natural gas pipe lines for Coast Counties Gas and Electric Company near San Juan Mission under the direction of John Kilfoyl, superintendent, have unearthed a huge flat surfaced stone more than four feet across, buried five feet beneath the surface of the road way, which according to Father Francis Caffrey, rector of the Old Mission, was probably used by Indian tribesmen a century ago to grind their corn.

The discovery was given to Father Caffrey as an addition to the mission museum, when it was discovered that the stone matched perfectly one which has been in the mission churchyard since the oldest inhabitant can remember.

The stone, weighing approximately a thousand pounds, was brought from its resting place by mechanical ditch diggers which are preparing the way for natural gas service to San Juan.

The natural gas pipe line that will supply San Juan is a branch of the main line that will bring natural gas to Watsonville and Santa Cruz from the transmission line that will supply Gilroy, Hollister, Morgan Hill and San Martin from the Kettleman Hills oil fields.

DUGGINS TO MANAGE GAS CO. AT CLAYTON, TEXAS

Management of the Clayton Gas Company of Clayton, Texas, has been transferred from Dalhart, Texas, to Clayton, with O. E. Duggins, formerly superintendent of the property, being appointed manager. The property was formerly managed by C. W. Smith, manager of the Dalhart Gas Company. Mr. Duggins will also have charge of the gas company at Texline.

BUFFALO AND SHERIDAN, WYO., TO HAVE NATURAL GAS

The Public Service Commission of Wyoming has granted Ivan D. Smith of Cedar Rapids, Iowa, a permit to construct a natural gas line from the Billy Creek Field in Johnson County, Wyoming, to the towns of Buffalo and Sheridan, a distance of 50 miles. The franchise provides that work must be started by July 1, 1930.

DALLAS GAS CO. OFFERS REDUCED RATES TO GAS CONSUMERS

A voluntary rate reduction offered by the Dallas Gas Company to the city of Dallas has been approved by the city commissioners. The new schedule was recently submitted by the company to John W. Everman, supervisor of Public Utilities and came as a complete surprise to city officials. The lower rate does not affect the industrial users but calls for a reduction in charges to domestic consumers who use more than 20,000 cubic feet of gas per month.

NEW PROCESS OF OBTAINING GAS IS ANNOUNCED BY RENNEY

Patenting of a process of utilizing gas obtained by burning coal underground has been announced by Leo Renney, petroleum engineer. Mr. Renney states that the burning coal could be controlled so that either petroleum or carbon dioxide could be produced. From the former he states that gasoline could be made and from the latter dry ice can be manufactured.

What's happening to the COOKING LOAD?

Constantly increasing use of canned and concentrated foods shortens cooking time . . . but Gas Refrigeration turns loss into profit by offering most satisfactory economical way of keeping food safely all year round.

A tiny gas flame takes the place of all moving parts

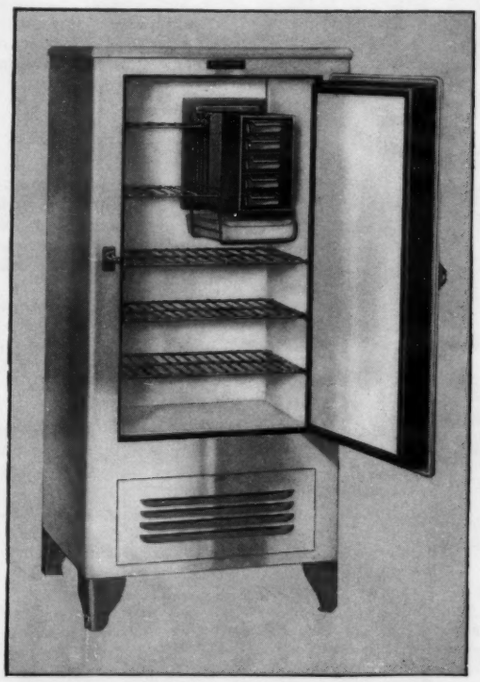
NEW ways of cooking take the place of old. Prepared foods . . . canned foods . . . concentrated and condensed foods . . . they take a minute to prepare where old-style cooking took ten. Result: the cooking load per customer drops off.

Fortunately there is available to every gas company a way to turn this loss into profit. Food that isn't cooking must be kept—and much of it must be refrigerated. Electrolux, the Gas Refrigerator, adds 1500 feet to each month's billing, or 18,000 feet a year.

Multiplied by only a few hundred users, the increase in load becomes an important source of income. Small domestic accounts, offering little if any profit, are put immediately on a sound, profitable basis.

Besides this *permanent* increase in billing, Electrolux offers a very substantial profit on every sale. Every woman wants an automatic refrigerator. And every day the swing to Gas Refrigeration gathers force. Widespread, persuasive advertising is telling your customers about the matchless advantages of Electrolux, the Gas Refrigerator. Most of them have already heard about its remarkable economy of operation . . . its freedom from machinery to wear out . . . its natural and permanent silence.

There's an unlimited market for Electrolux in your community. Unlimited profit for the gas company that wants it. Write, wire or phone Electrolux Refrigerator Sales, Inc., Evansville, Indiana.



Hostess model Electrolux, a very popular size for the average family

ELECTROLUX

THE *Gas* REFRIGERATOR

EMPIRE
Oil Meters

Positive Displacement
Oscillating Piston Type

Simple in Construction—Easy to Operate—Low in Cost of Maintenance

EMPIRE meters are highly accurate, and **stay** accurate. They are invaluable for cracking and absorption processes; for gas companies; for refiners and distributors of gasoline and all distillates of petroleum; for measurement of crude oil, cold or hot.

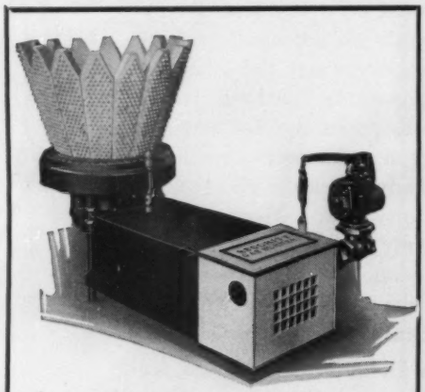
ALL SIZES ⅝" TO 6"

Standard meters will withstand working pressures of 150 lbs. to the square inch. High pressure types will handle 300 lbs. Higher pressures and special types to order.

National Meter Company

299 Broadway, New York

1048 Folsom Street, San Francisco **645 Santa Fe Avenue, Los Angeles**



We Manufacture a Full Line of Strictly

High Grade Gas Appliances

Including

Conversion Gas Burners
Circular Heaters
Warm Air Furnaces
Gas Ranges

Our Catalog is yours for the asking

SECURITY STOVE & MFG. CO.

Kansas City, Mo.

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

Classified Advertising

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge. Small professional cards 1-in. deep by 21 ems wide are $5.00 monthly on 12-time contract.

SITUATION WANTED—MALE

A sales representative of a public utility seeks a change wherein he can find a greater opportunity. The applicant has had a well rounded business career, including office management, finance and sales. Address Box E-21, care of Western Gas, 124 West Fourth Street, Los Angeles, California.

WANTED—Position as sales manager. Experienced in gas appliance merchandising. Have promoted, organized and managed merchandising department for two large gas utilities, and have had more than 10 years experience in the gas business. Will go anywhere. Address Box E-20, *Western Gas*, 124 West Fourth Street, Los Angeles, California.

CHALDRON GAS COMPANY TO BEGIN SERVICE APRIL 1

The Chaldron Gas Company of Chaldron, Nebraska, reports that gas service will be available in that town by April 1, 1930. The company recently purchased the Mildred Block, and have office and display rooms in the building. A location for the manufacturing plant has been purchased, and work is underway on the construction of the plant and warehouse.

SO. CAL. GAS COMPANY BUILDS LINE TO PALM SPRINGS

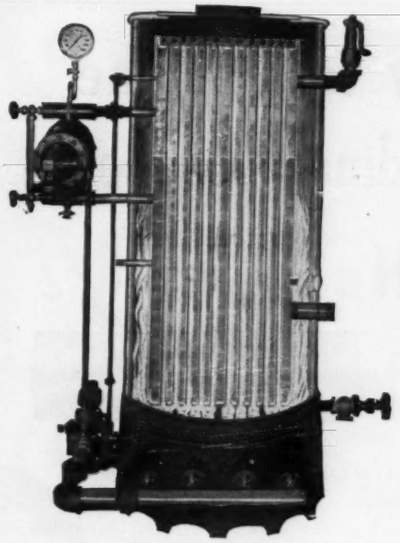
The Southern California Gas Company, with headquarters in Los Angeles, California, is constructing a transmission line from Banning to Palm Springs, a distance of 26 miles. The line is expected to be complete early in February, and will serve a resort population of between 300 and 400 consumers.

MISSOURI-KANSAS PIPE LINE DOUBLES GAS SUPPLY

Missouri-Kansas Pipe Line Company entered 1930 with approximately 250 million cubic feet of natural gas under its control in the states of Kansas, Missouri and Kentucky. This daily open flow gas test figure is in excess of 100 per cent greater than it was in the middle of 1929, according to Frank P. Parish, president of the company.

CARL REITER ASKS TO SERVE BREMERTON, WASH.

Carl Reiter of Seattle has applied to the city of Bremerton, Washington, for a franchise for the service of gas in that city. The franchise of Charles Collins will expire on July 1, and the petition for a permit filed by Leon Melekov was recently withdrawn.



Section View

10-H.P. Standard KANE Boiler
Equipped with Low Water Gas Cut-off and
Model 30 Automatic Gas Supply Control

Increases Efficiency

of Steam Processes!

KANE Gas-fired process steam generators are automatic, burning fuel only in proportion to the steam withdrawn . . . They are clean, both in operation and *purity* of steam delivered . . . They are compact, requiring small installation space, and may be placed close to the process operation, eliminating inefficient long *pipe lines* . . . Pressure is unvarying under load—which makes for accurate and consistent results from any steam process . . . Kane Boilers are available in suitable capacities up to 30 H. P. for any need—but multiple units of two or more Kane boilers are not uncommon. Write our nearest branch office.

Send for Bulletins and Price Sheet

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Chicago—363 W. Erie St.

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1903-1915 EAST HAGERT ST. PHILADELPHIA

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St. Louis—2010 Locust Blvd.
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Manufacturers of Gas Boilers • • Water Heaters

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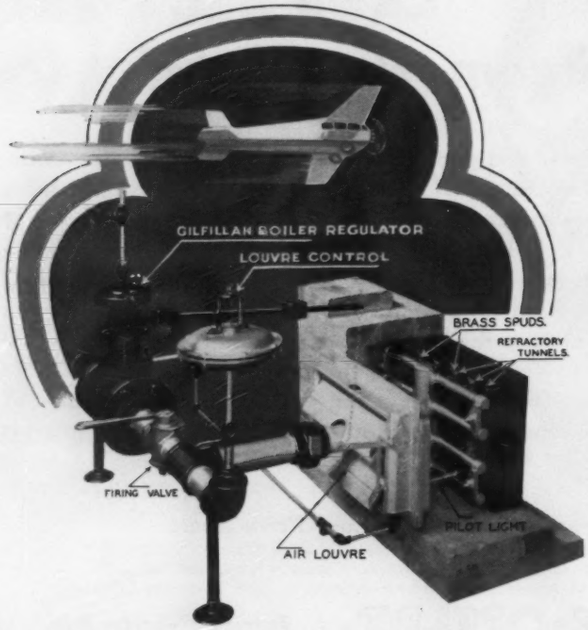
House Type
High Pressure Balanced Valve
Low Pressure Balanced Valve
High Pressure Compounding
Propane, Butane or Bottled Gas

The Reliance Line now includes a regulator for every purpose in sizes up to six inches, all embodying their patented toggle joint action. Fifteen years experience has proven conclusively that for positive lockup, sensitive and close regulation, great capacity and low cost of upkeep, this device has no equal.

Reliance Manufacturing Co.

Alhambra, California

WEBSTER
Radiant Gas Burners



Service by Airplane when necessity demands

A call for service on a Webster Radiant Gas Burner . . . immediately, a trained engineer starts by airplane, traveling hundreds of miles, spending time and money that a customer may be satisfied—that is an example of the service rendered recently by the Webster Engineering Company.

Service such as this, backing up Webster quality, is the reason why gas companies specify Webster Radiant Gas Burners in preference to all others. They **know** their customers will be satisfied.

Webster Radiant Gas Burners are as perfect as it is possible to make them. However, there are rare instances where a Webster Radiant Gas Burner may need special adjustment after installation—a Webster engineer stands ready to work with the gas company to the limit in cases of this nature.

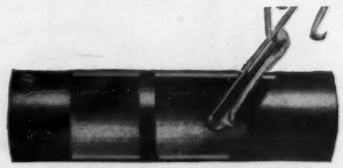
May we tell you more about Webster Radiant Gas Burners and how we will assist you to obtain more prospects and added business? . . . write today . . . the obligation is ours, not yours.

The Webster Engineering Co.
TULSA - OKLA.
Boiler Burner Division of
The Surface Combustion Co.
Subsidiary of Henry L. Doherty & Co
2375 DORR STREET, TOLEDO OHIO
Branch Offices in All Principal Cities
Member of Industrial Furnace Manufacturers Association

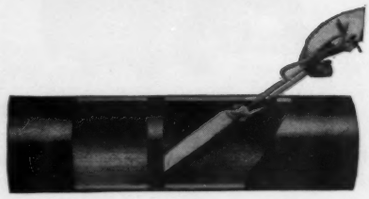
How to Use the Goodman Stopper

Four Easy Steps

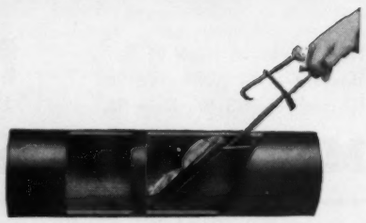
Insert in Tap like this



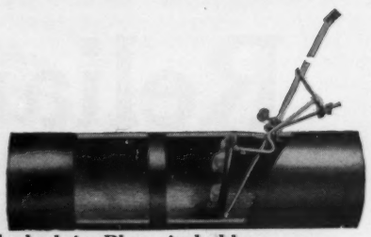
Turn to Right like this



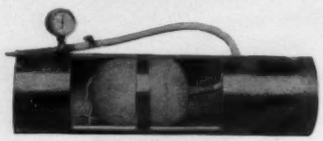
Engage Z Handle in Tapping. Pull long Handle to you



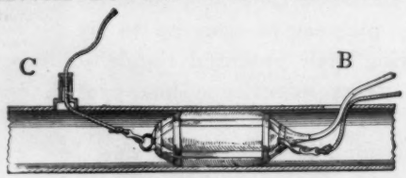
Lower Locking Sleeve and lock in Place like this



When locked in Place it holds



TYPE "C"
CANVAS COVERED GAS MAIN BAGS



CYLINDRICAL BAGS

Safety Gas Main Stopper Co.

523 Atlantic Avenue Brooklyn, N. Y.
Cable Address: Gastopper, N. Y.

A
Stove and a Half for the Price of One

A SALESMAN'S time is his capital. Invest your "time" where it pays the biggest dividend. It takes less time to sell the Spark Lid Top gas stove with the patented 50% increased top cooking surface.

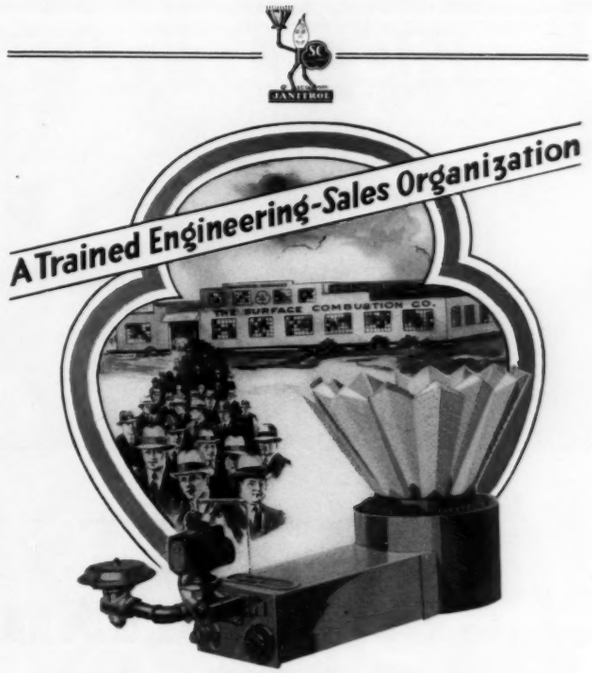
Housewives appreciate the advantages of gas over any other fuel—but they object to the small cooking top (four burners) on the ordinary gas stove.

It takes half the time to sell them the Spark with a cooking top equivalent to a six burner gas stove.

Gas burners in the kitchen incinerator add 50% to the cooking surface.

The Spark costs no more—occupies the same space as an ordinary four-burner kitchen heater model stove and yet has 50% additional top cooking surface — a feature found on no other stove—always in reserve. Let us furnish you with further information covering this patent and other exclusive features found only on Spark gas ranges.

Hammer-Bray Co.
Oakland California



··stands back of every JANITROL you sell

"Your JANITROL representative," said a well known gas company executive recently, "is absolutely indispensable to us—we could not sell these conversion burners without his able assistance."

The above remark is but an indication of the cooperation given to gas companies selling JANITROLS. JANITROL representatives are both engineers and salesmen. They stand ready at any time to assist gas companies in selling or servicing this modern home heater.

The name JANITROL—automatic "controlled janitor"—was selected for its value as a name easily remembered and quickly understood. It will soon be known as a household term for all that is best in conversion burners . . . it will stand for the only conversion burner approved by the Underwriters Laboratories . . . the only conversion burner having the many exclusive Surface Combustion features.

And to gas companies, JANITROL means, as it always has, the only conversion burner offering plenty of merchandising profit in addition to its satisfactory load building.

May we tell you more about JANITROL and its place in your organization? Write today. There is no obligation.

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for **RESULTS** *the* **CLEVELAND BABY DIGGER**

Public utilities in all parts of the country have found the speed and economy of the Baby Digger so effective that they have been able to greatly increase the number of extensions of their lines thus bringing additional revenue. With the Baby Digger they have dug hundreds of miles of trench in the heart of some of the largest cities, where underground pipes abound, with minimum disturbance to property and the general public.

Compact, mobile, powerful, sturdy, and fast the Baby Digger is especially designed to deliver maximum results in gas trench construction.

It is only 58" in extreme width. Think what this means when your line of trench must pass close to trees, buildings, poles, etc., along the edge of highways or down narrow alleys. It slips easily by, around, and between these obstructions.

Easily and quickly transported on its own specially built trailer from job to job, the Baby Digger materially increases productive time.

You can not afford to be without Baby Digger economies in your 1930 trenching work. Write today for full information.

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"Pioneers of the Small Trencher"

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EDWARD R. BACON CO.

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San Francisco California

SPRAGUE SEMI-CHROME LEATHER

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After

FIVE YEARS' TESTS AND EXPERIMENTS

May we send you
samples and data?

The Sprague Meter Co.

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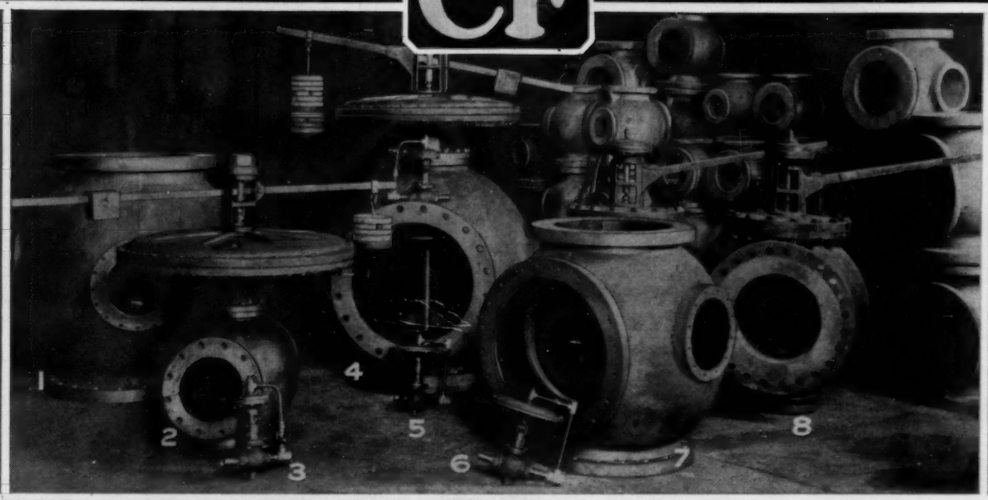
BIG ONES OR LITTLE ONES
-A COMPLETE LINE OF DEPENDABLE CF REGULATORS

1 BODY FOR TWENTY-FOUR-INCH LOW PRESSURE REGULATOR.

2 A TEN-INCH DIFFERENTIAL REGULATOR.

3 A THREE-FOURTHS INCH HIGH PRESSURE REGULATOR.

4 TWENTY-FOUR-INCH DIFFERENTIAL REGULATOR FOR MIXING GASES.



5 ONE-INCH HOUSE REGULATOR.

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Chaplin-Fulton therefore represents a most complete and a highly dependable line of products. Catalogues are available which describe each Regulator.

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Successfully Used by Gas Industry All Over the World!

Write for Demonstration

Examined, Tested and Approved by American Gas Association. An adjunct to Prone Pressure Method of Artificial Respiration in the Successful Resuscitation of Victims of Carbon Monoxide Poisoning, Gas Asphyxia, Etc. Full Particulars Gladly Furnished on Request. Bulletin No. 80 gives Complete Information

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Braddock, Thomas and Meade, Pittsburgh, Pa.

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WESTERN GAS from time to time receives requests from manufacturers asking to be put in touch with capable men or organizations in the Southwest or on the Pacific Coast who are able to effectively market their products in the western gas industry.

We also receive requests for suggestions from men or selling organizations covering the Pacific Coast as well as the Mid-Continent section, who desire to extend their activities in this industry by taking on new products or additional lines.

If we can be of service to you in this way, get in touch with any one of our three offices—Los Angeles, 124 West Fourth Street; Dallas, 307 Thomas Bldg.; San Francisco, 447 Sutter Street.

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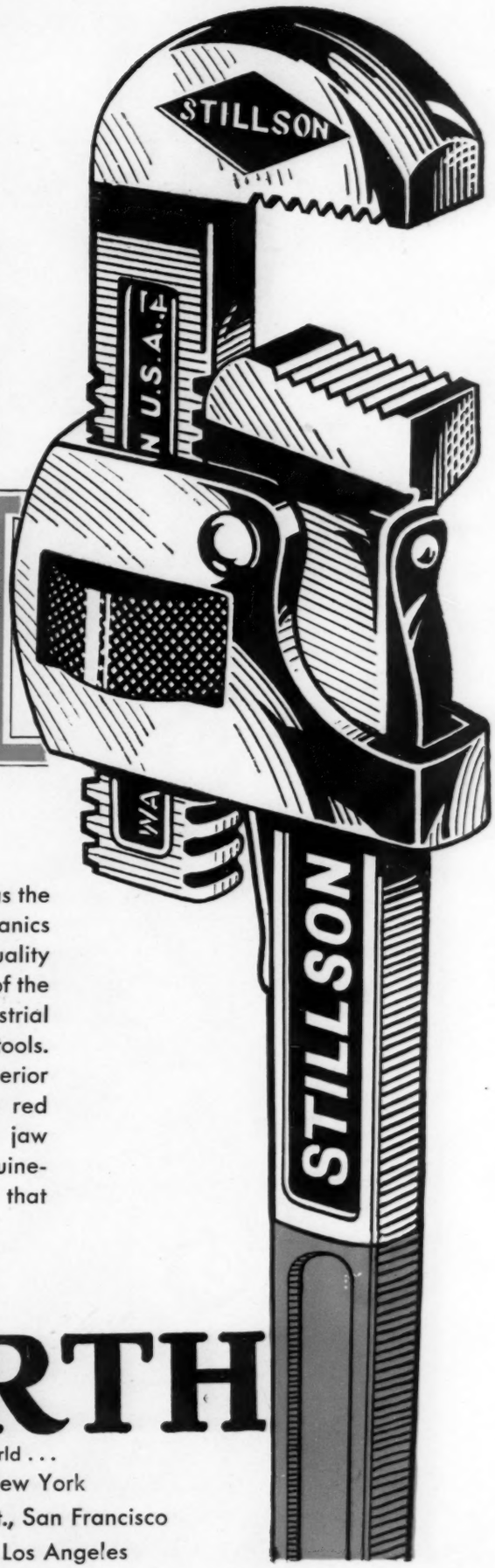
for **Severe Service**



THEY ALL KNOW THE GENUINE

● The reputation of the Walworth Master Stillson as the Genuine appeals to the men in the shops, the mechanics whose efficiency and safety depend upon the quality of the tools they use. ● This general acceptance of the genuine Stillson all up and down the line in industrial plants is based on years of experience with pipe tools. Mechanics prefer this wrench because of its superior strength, lasting quality and performance. ● The red handle and Dan Stillson's trade-mark on the jaw guarantee the greater strength as well as the genuineness of Walworth Master Stillsons to every man that uses them. ●

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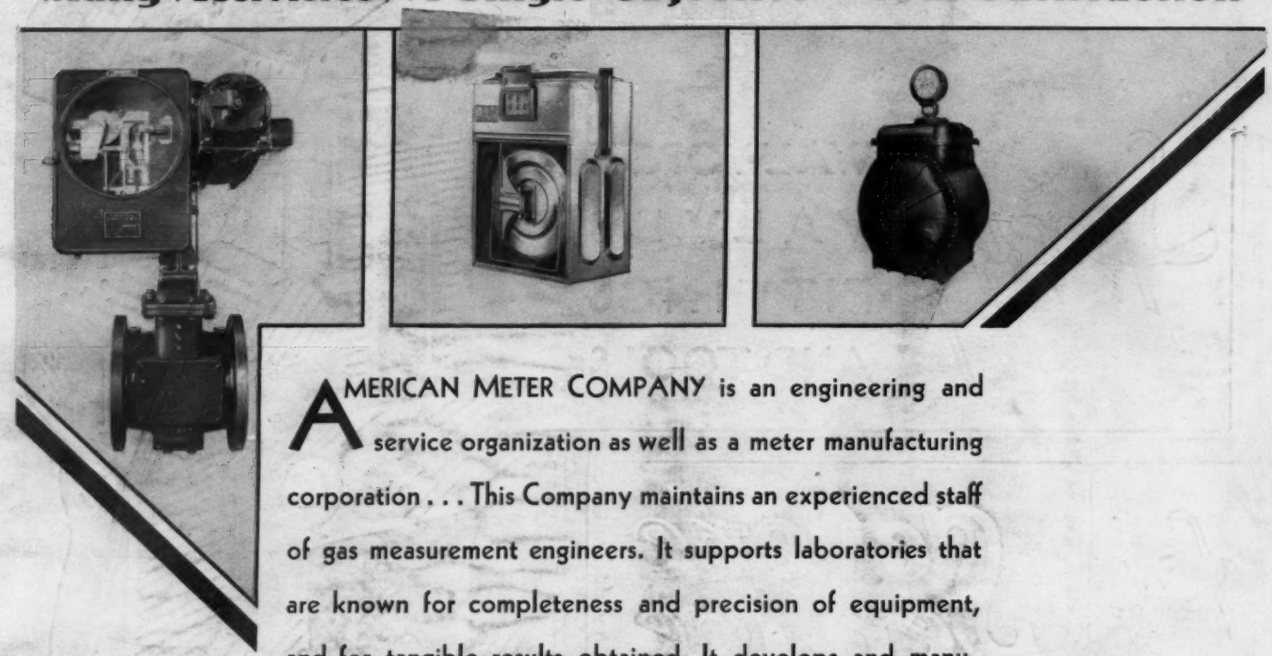

AMERICAN METER COMPANY is an engineering and service organization as well as a meter manufacturing corporation . . . This Company maintains an experienced staff of gas measurement engineers. It supports laboratories that are known for completeness and precision of equipment, and for tangible results obtained. It develops and manufactures gas and meter testing apparatus that is standard equipment in laboratories... American Meter Company Gas Meters are the result of long experience, practical research and painstaking manufacture. Their serviceability and accuracy makes them economical to use . . . An outline of the complete information furnished by American Meter Company service on the various requirements of gas measurement engineering will be sent on request.

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